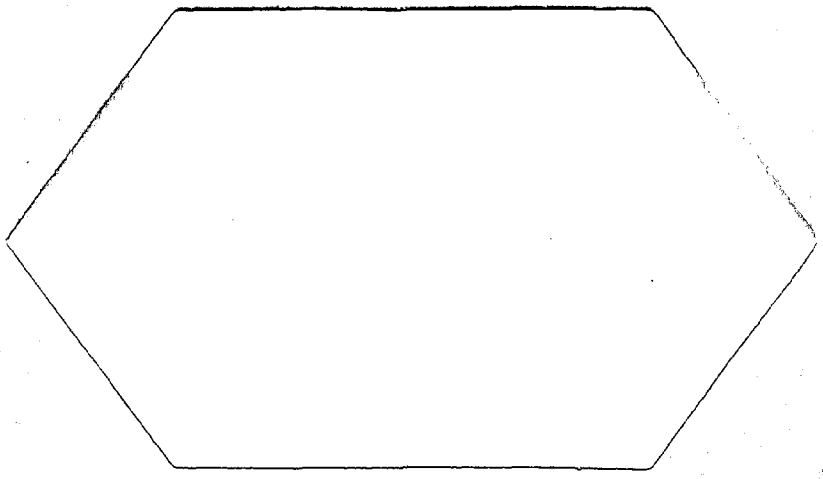


Science Research Institute • GPO Box 8776 • Phila., Pa. 19101

THE PRESERVATION OF OPEN SPACE IN THE NEW JERSEY PINELANDS

by

D. Berry, M. Ontko, D. Scott,
M. Silberfein & Gene Steiker

RSRI Discussion Paper Series:
No. 73

May 1974

The purpose of this series is to encourage the earliest possible dissemination of research results. Appearance of a paper in this series does not preclude later formal publication in journals or elsewhere. The authors invite comments and reactions.

These papers were originally presented at the 1973 convention of the Middle States Division, Association of American Geographers held in Philadelphia: Chairperson, Marilyn Silberfein.

Regional Science Research Institute
P.O. Box 8776
Philadelphia, Pennsylvania 19101

Contents

INTRODUCTION -- by Marilyn Silberfein

> Stare into the tea-colored water flowing past the canoe and for a few moments you're convinced you are moving backwards. Look up just in time, it turns out, to avoid a sandbar - and the illusion of spacial regression disappears, replaced immediately with the illusion that you are moving backwards through time.[1]

There is a current fascination with a several thousand square mile block of central New Jersey known as the Pine Barrens* The area is located in the heart of megolopolis and in the most urbanized state in the nation, but it still has an average population density of only sixteen persons per square mile.

For many city dwellers the Barrens have become a near-by "wilderness refuge" attracting hikers, campers, hunters, and canoe and wildflower enthusiasts. At the same time, the land speculators have taken note of the area's potential for commercial facilities and suburban housing. Thus, a conflict of interest is emerging between the demands of the public for open space and the goals of the land developers. It is the resolution of this problem which forms the focus of the papers and commentary which follow.

*For a map of the area see Figures 1 and 2 in the article by Michael Ontko.

A full appreciation of the Pine Barrens requires a brief historical overview. From the eighteenth century, the area has been characterized by a polygot ethnic composition with representations of Hessian soldiers, French Huguenots, fugative criminals, and escaped slaves. All of these groups functioned in an economic backwater, except for a brief period in the mid nineteenth century. During this phase, local bog iron ore was exploited in the production of pig and wrought iron. According to the Atlantic Monthly of 1840, an expectation of industrial growth and expansion pervaded the Pinelands.

By the end of the next decade, however, the iron industry had shifted to Western Pennsylvania. The towns of the Barrens attempted to salvage their economy by turning to the manufacture of glass and paper, but these activities lost out to other centers. Gradually, families of the region began to evacuate and whole communities fell into a state of disrepair. According to the 1846 records of the American Tract Society:

> "The wood is generally gone so the people are poorer than they were a few years ago and likely to remain poor. Towns and populous neighborhoods can never be on such barren sands."[2]

Following their economic demise the Barrens remained

relatively isolated. Railroads were built throughout the state of New Jersey, but those lines serving the Barrens were later abandoned and other lines planned for the area were never built. Isolation increased as the heart of the Barrens came to be ringed by blueberry and cranberry farms and a large tract was acquired by the state government (The Wharton Tract). Behind the farm perimeter, a few small communities continued to function, based on such activities as the collection of sphagnum moss and christmas greens, the preparation and sale of charcoal and lumber, and occasional extra-regional employment in Philadelphia, Camden, and the vacation hamlets along the south Jersey shore.

Unfortunately, by the beginning of World War I, the reputation of the Barrens as an attractive wilderness refuge was shattered by the writings of a South Jersey psychological researcher. Her thesis suggested that the occupants of the Pine Barrens were inbred, vicious, and mentally deficient.[3] The governor of New Jersey proposed at one point that the entire area be isolated from the rest of the state to prevent the spread of genetic contamination. To this day these fallacious beliefs still circulate, although the stories have gradually

been discredited.

None of the events which occurred in the Pine Barrens completely discouraged the activities of the land speculator. As early as the 1860's, the name of the town of Atsion was temporarily changed to Fruitland, and small lots were carved out of the near-by countryside.[4] The availability of these lots was advertised, but with little initial response from the general public. As a result of this type of speculation, however, land titles in the Barrens became completely confused.

The recent emergence of the Pinelands as a focus for land development has been the logical outcome of urban sprawl in central Megolpolis. There are already housing developments around the edge of the area and for-sale signs are appearing along roads that pass through unoccupied woodland. A major highway and a regional jetport have been proposed, although both ideas have raised an outcry of protest. In all, five hundred thousand acres are in the hands of developers, many of whom are simply waiting for the price of land to rise.

An important step in controlling future land uses was taken with the creation of the Pinelands Environmental Council in 1972. It consists of representatives of government, administrators, elected officials, conservationists, and local farmers. In

addition to creating an overall plan for the region the Council is charged with evaluating all development plans. Lacking actual veto power, the Council can still carry out thorough investigations, hold public hearings, and make recommendations. The Council is also empowered to assist regional and municipal boards in devising appropriate local ordinances to ensure the maintenance of the Pinelands as a resource.

According to A. Jerome Walnut, assistant director of the Burlington County Planning Board, the following attributes provide the basic rationale for the preservation of the Barrens:

1. The immense underground water supply. The Cohansey Formation under the Barrens is one of the largest reservoirs of pure, fresh water on the North American Continent, but it is highly susceptible to pollution from surface sources, septic systems and industrial wastes. Local pollution is apt to spread out horizontally to affect a large area. The State of New Jersey purchased the Wharton Tract in 1954 to help protect this supply.

2. The area's historical heritage. Trade and industrial enterprises were very active here around the time of the American Revolution and into the Nineteenth Century. Cedar staves were exported to the West Indies, and much of the area was cut over for timber and charcoal. Bog iron was processed here and exported, and Stephen Decauter is reputed to have tested his cannon here. The relics of this heritage still exist, and the State is restoring some of this in the Village at Batsto.

3. The region's natural history. The region is the northern limit of many southern plants and animals and the southern limit of a number of subartic species, which gives an interesting mixture. Moreover, it is the home of several rare varieties of ferns, orchids, reptiles and other species. Not only does this have a value in itself, but the Pine Barrens are an excellent outdoor laboratory for study and research within easy distance of several major universities.

4. The agricultural complex. The region sustains an extensive cranberry-blueberry agricultural complex, which is utterly dependent on the combination of acid podzolic soils, climate, and a vast supply of clean fresh water. This region in New Jersey is the third-largest producer of cranberries in the country, and it makes a substantial contribution to the local economy. However, if any of the factors of soil, water or climate are disrupted or polluted, the whole complex would suffer.

5. Recreation potential. There are a number of camp grounds, gunning clubs, parks and other facilities in the Barrens, and the area is within reasonably easy reach of Philadelphia and New York for recreation. Given the trends of increasing affluence and leisure time, the demand for near-at-hand open space seems bound to increase. The Barrens, especially along the streams, are beautiful and spacious and should have much potential in this direction.

The main question to emerge from this discussion is not whether portions of the Pine Barrens should be maintained in a natural state but how much land should be set aside and how such portions would be selected and purchased. Alternative strategies have been proposed, but no satisfactory compromise has been derived. For example, the creation of a Pinelands National Park has been suggested, but this option would eliminate some of the important features of the region such as the Cranberry and Blueberry farms.

All of these factors which contribute to decision-making in the Barrens are discussed in the following papers and commentaries.

REFERENCES

1. Rod Townley, "Deliverance in the Pine Barrens," The Philadelphia Inquirer, August 26, 1973, p. 20.

2. Quoted in John McPhee, The Pine Barrens, Ferrar, Straus and Company, New York, 1968, p. 38.

3. Robert McGarvey, "The Pine Barrens: Isolation and Image," Unpublished Masters Thesis, Temple University, Philadelphia, Pa., 1972.

4. Private Communication from A. Jerome Walnut, Assistant Director, Burlington County Planning Board, February 8, 1974.

ENVIRONMENTAL RIGHTS AND OPEN SPACE -- by David Berry

"[D]o we not sing our love for and obligation to the land of the free and the home of the brave? Yes, but just what and whom do we love? Certainly not the soil, which we are sending helter-skelter downriver. Certainly not the waters, which we assume have no function except to turn turbines, float barges, and carry off sewage. Certainly not the plants, of which we exterminate whole communities without batting an eye. Certainly not the animals, of which we have already extirpated many of the largest and most beautiful species." -- Aldo Leopold, A Sand County Almanac, p. 204.

Within the last decade or so we have become more and more conditioned to the vague concept of environmental rights and perhaps even some have found themselves comfortable with this notion. Yet the weak response to the urgent pressure for development of the New Jersey Pinelands points up the disarray of the structure of the rights that people and plants and animals have within the existing social and legal institutions to protect this large semi-wilderness area.

In this paper I hope to outline two sources of environmental rights deriving from ecological and social claims for protecting the Pinelands and to indicate by way of an example how these claims may be played off against longstanding social mechanisms such as the land market. Environmental rights may

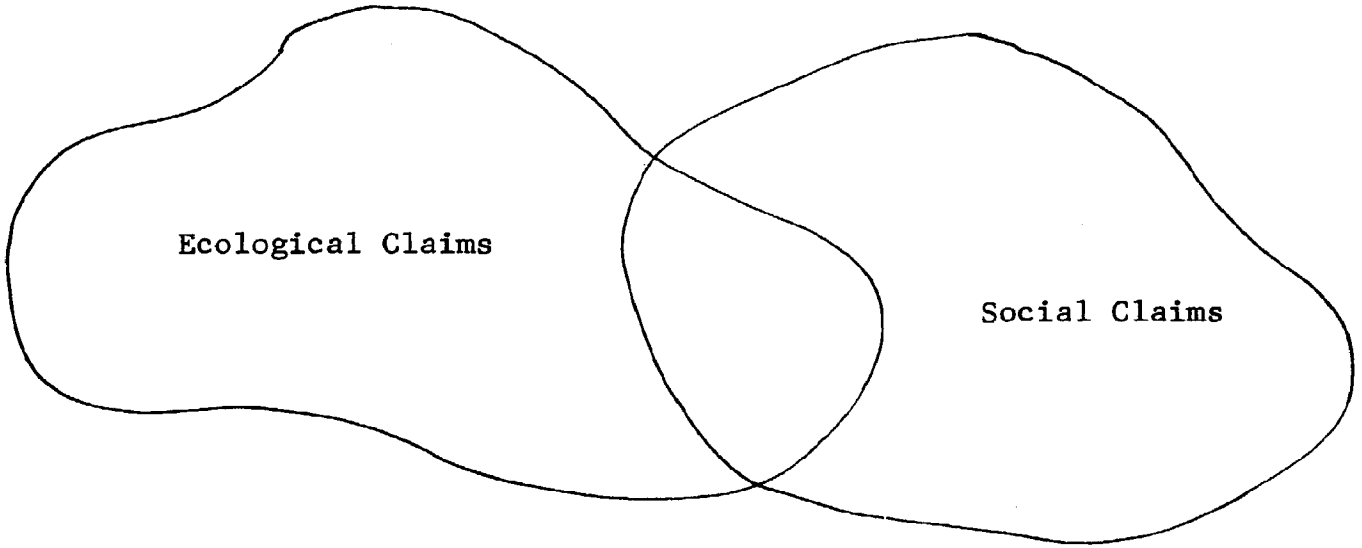
be envisioned as the justification for institutional means for recognizing ecological and social claims.

Ecological and social claims are not entirely independent sources of environmental rights since society may put some value on environmental protection, but the whole of ecological claims generally transcends consumer evaluation of environmental protection. This can be concisely rendered in terms of a familiar Venn diagram. See Figure 1.

Ecological Claims

The origin of ecological claims for protecting the Pine Barrens from disturbance by man is simple enough. The spectrum of plants and animals indigenous to the Pinelands (or anywhere else for that matter) merit protection because they exist there and have existed there for some time in harmony with each other and with their physical environments. The right to continued existence with minimal human intrusions is based on this natural occupation of the land. The entirety of the earth, New Jersey included, is not solely the inheritance of man and his technology; other forms of life are as meritorious as Homo sapiens. Plants and animals benefit from protection of their habitats and suffer from the destruction of their habitats so it is

Figure 1. Sources of Environmental Rights



Social claims for environmental protection constitute the intersection of the ecological and social claims.

therefore necessary to consider them in the evaluation of environmental rights.

Ecological claims are really first principles that are difficult to derive from more fundamental beliefs without tedious circumlocution. Their defense in this paper will instead lie on acceptance of their correlaries and implications which we now examine.

Correlaries of Ecological Claims

First of all, the ecological claims for protecting the Pinelands can be interpreted more clearly if the ecological basis for these claims is outlined. The Pinelands are a major system of plant and animal communities covering over one million acres of South Jersey (McCormick, 1970). More specifically, an inventory of vegetation reveals two basic associations: lowland areas and upland areas. These are not so much descriptions of elevation, as the Pinelands are rather flat, but are reflections of soil characteristics.

Upland areas exhibit highly permeable soils whose seasonal high water table often lies more than six feet below the surface (Soil Conservation Service, 1971). The soil is dry and the vegetation pattern reflects this. Upland tree species consist

almost entirely of mixtures of pitch pine and several of the following oaks: blackjack, post, bear, white, black, scarlet, and chestnut. The trees rarely grow over forty feet in height and many oaks are shrublike in appearance. Common understory and groundcover include sheep laurel, blueberries, and various ferns. The forest is sparse compared to, say, Pennsylvania woodlands, and sunlight can usually reach the forest floor.

A major influence on upland vegetation is the recurrence of fires, which may sweep large areas of dry vegetation every few years. This has had a pronounced influence on natural selection of upland vegetation (McCormick) and seems to have had an especially important role in causing dwarf oak-pine forests in the East and West Plains area of the Pinelands.

Lowland areas are wet all or part of the year and are often characterized by mucky soils. Dominant vegetation varies here somewhat more than in the uplands and the following tree species occur in varying proportions: trident red maple, pitch pine, Atlantic white cedar, tupelo, sweetbay and occasionally gray birch. Nearly pure stands of red maple or cedar are common. The understory and ground cover include leatherleaf, sphagnum moss, and the insectivorous sundew. In contrast to the uplands, lowland vegetation is extremely thick, and many

areas are so dense that it is not possible to walk through.

In summary, McCormick estimates the following inventory of plant and animal species:

Plants

Total plant species -- at least 550 and probably 600 to 700

Plant species whose southern limit occurs in Pinelands -- 13

Plant species whose northern limit occurs in Pinelands -- 109

Plant species occurring only in the Pinelands -- 2 (?)

Animals

Mammals -- 34 species

Birds -- 144 species

Frogs and Toads -- 13 species

Salamanders -- 10 species

Turtles -- 9 species

Lizards -- 3 species

Snakes -- 17 or 18 species

Fish -- 24 species

Insects -- ? (butterflies -- 91 species)

Secondly, the name "Pine Barrens" is an unfortunate legacy. According to the dictionary something is barren if it is not productive, and certainly the implication is there in the minds of many people that this land is idly sitting by, doing nothing, but waiting for the hand of developers to exalt its being with houses, shopping centers, industries, and roads. This myth about the land being unproductive is compounded by the widespread notion of worthless species that contribute nothing to man's

well-being, as if plants and animals evolved to be inputs into technological achievements. Any place that can support several hundred species is clearly not unproductive.

Thirdly, we must be careful to recognize that ecological claims are not anthropocentric. They do not rely on "consumption" by man, but they nonetheless must be recognized and accepted by man so that his harmful activities may be averted in such ecologically valuable areas as the Pinelands. Stone (1972) discusses the legal implications of this point.

Implications of Ecological Claims

To conclude this section, we can derive a few basic rules on planning for the protection of open space in recognition of ecological claims. First, there are several kinds of major plant associations and numerous minor associations in the Pinelands, and representative areas of all of them should be allowed to remain as undisturbed as possible. The region is not a homogeneous mass wherein any random chunk will do as the site selected for preservation as open space.

Secondly, protected areas should not be so small as to raise the probability above a minimum level such as 1% or 5% that rarer plants or larger animals will face extinction. Estimates of these probabilities may be obtained through techniques such

as species area curves (Cain, 1938). Thus, even a well landscaped front yard will hardly compensate for the disruption of the ecological features which existed there before.

Thirdly, the plant and animal communities and their physical environments are interrelated, most obviously via the drainage system and through food chains, so that the land and water areas through which these linkages are maintained should be protected. The desirable spatial pattern of interconnected areas of open space can thus be described as a series of functional, self-maintaining natural regions representative of the local ecological systems.

Social Claims

It is apparent that land has a dual nature. On the one hand it can be a private good divided up into private lots for homes and businesses and bought and sold by private individuals acting independently of each other in the land market. On the other hand, it can be a public or collective good, protected as public open space to be enjoyed by the entire community and toward which many people contribute taxes. These two uses are mutually exclusive and are further contrasted in the need for collective action rather than private, independent action in order to preserve land as open space.

Open space serves at least three major uses for society: It furnishes a community with scenic amenities, provides places for outdoor recreation, and affords the community a measure of environmental protection. Since collective action is necessary for people to express their demand for these uses of land in any combination, one cannot go to the town hall and look up records of prices paid for various quantities of land purchased for open space uses as one can for private uses. The demand for open space can be registered only through governmental action to preserve ecologically valuable land, and in the case of the Pine Barrens governmental processes seem inadequate indicators of social claims. Only about 14% of the total Pine Barrens is presently protected to any degree by the State and another 4% is in military reservations (McCormick).

Notwithstanding the lack of a marketplace in which to measure the demand for open space, it is possible to estimate consumer evaluation by means of household interviews concerning willingness to pay to acquire public open space in the Pinelands. While reporting the average household's willingness to pay for x acres of open space disguises the variances in demand with income (implying the need to tax for open space in accordance

with income) it is still a useful measure of the strength of social claims for open space.

To illustrate the nature of these claims we can observe the results of a set of household interviews for Medford Township, New Jersey, a community two-thirds of whose 41 square miles lies inside the Pine Barrens and which is about to experience a tripling of its population over the next decade to about 30,000 people. These interviews were conducted to provide information for the township open space plan (Berry and Coughlin, 1973).

The reader should be cautioned that the attitudes expressed in this survey apply only to the local plan and cannot be directly translated into attitudes of all New Jersey residents toward hundreds of thousands of acres of Pinelands. A new survey would have to be undertaken to identify social claims for the entire Pine Barrens. Nonetheless, the Medford results are indicative of the importance of an open space program developed at the community level.

The annual willingness-to-pay curve shown in Figure 2 for the average Medfordite reflects a moderately strong desire to protect open space in that municipality. No effort was made

to determine willingness to pay for open space in the Pinelands outside the township, however. Assuming the average resident's attitudes toward open space remain the same in the future except for the effects of inflation (at the rate of 5% per year), the annual willingess-to-pay curves for the average household are shown for the years 1980 and 1985 as well as for 1973 in Figure 2.

Three statistically significant regularities occur in the Medford sample. First of all, social claims for preservation of open space become stronger as income rises, as shown in Figure 3. Using the Mann-Whitney U test on the sample willingness to pay for four square miles of open space within the Township, households earning over $15,000 per year significantly outbid households earning less than $15,000 per year at the 5% level. Recall that this implies that households should be taxed for open space according to income. In addition, as the general level of income rises, we can expect social claims for open space to strengthen accordingly.

Secondly, length of residence in Medford affects willingness to pay for open space. See Figure 4. Households living in Medford for a year or less significantly outbid households living in the Township for 10 years or more at the 4% level according

Figure 2. Average household's annual willingness to pay for open space in Medford by Year

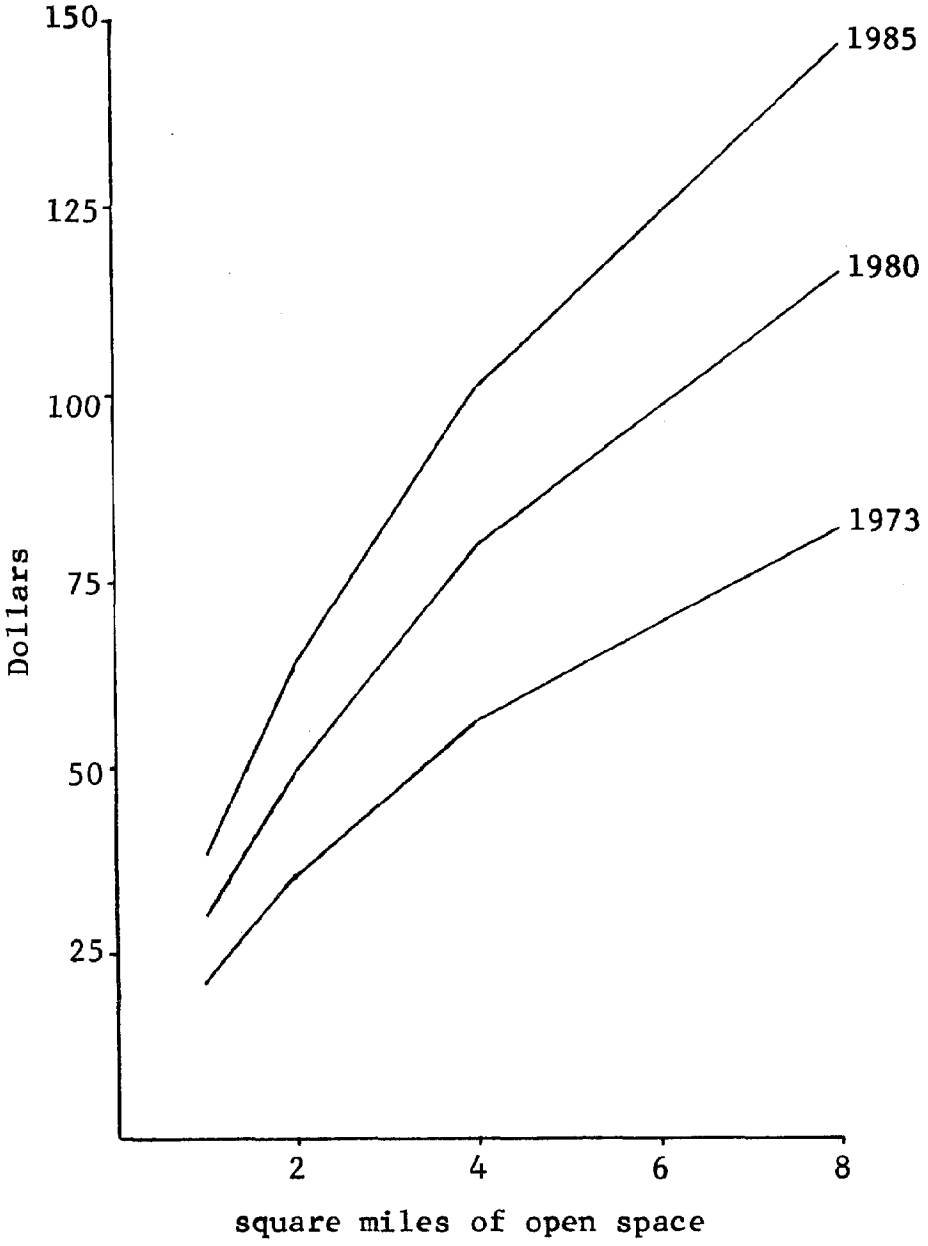


Figure 3. Average household's annual willingness to pay for open space in Medford by Income

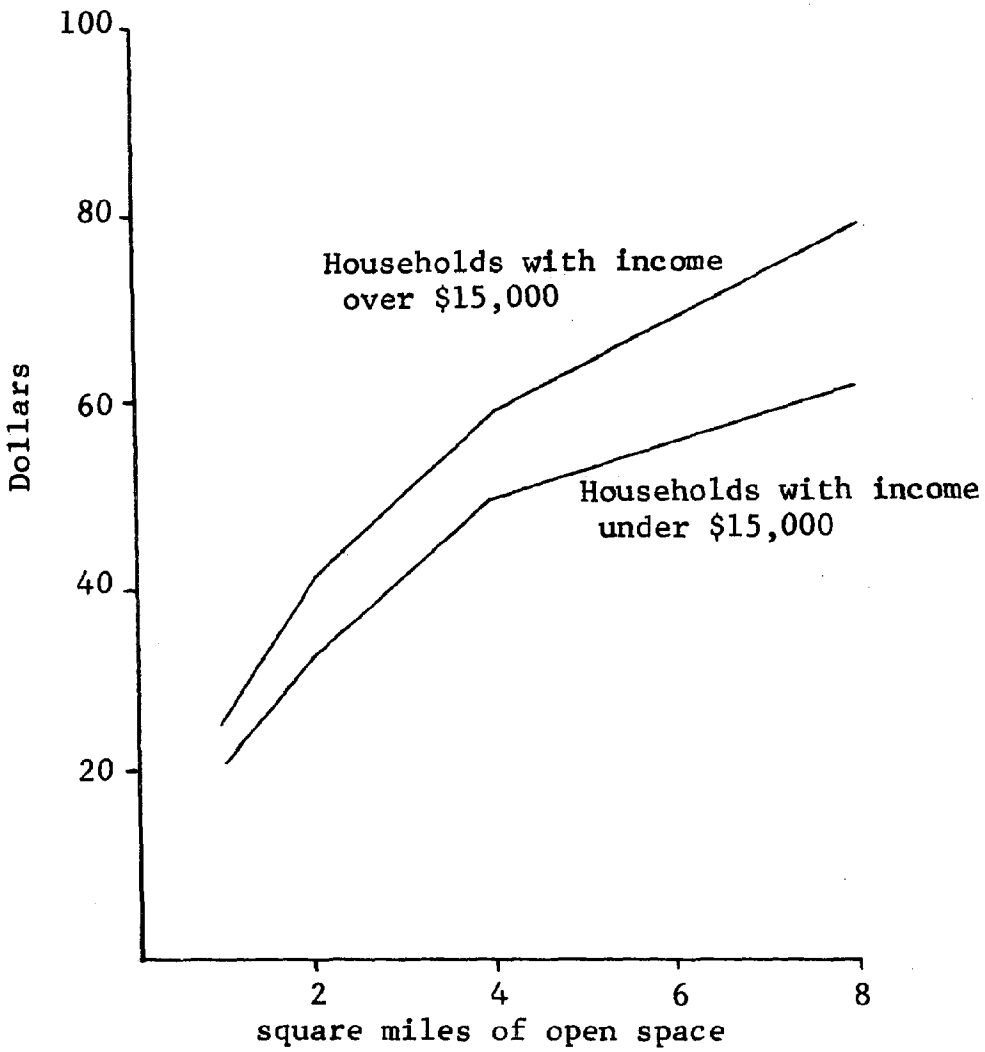
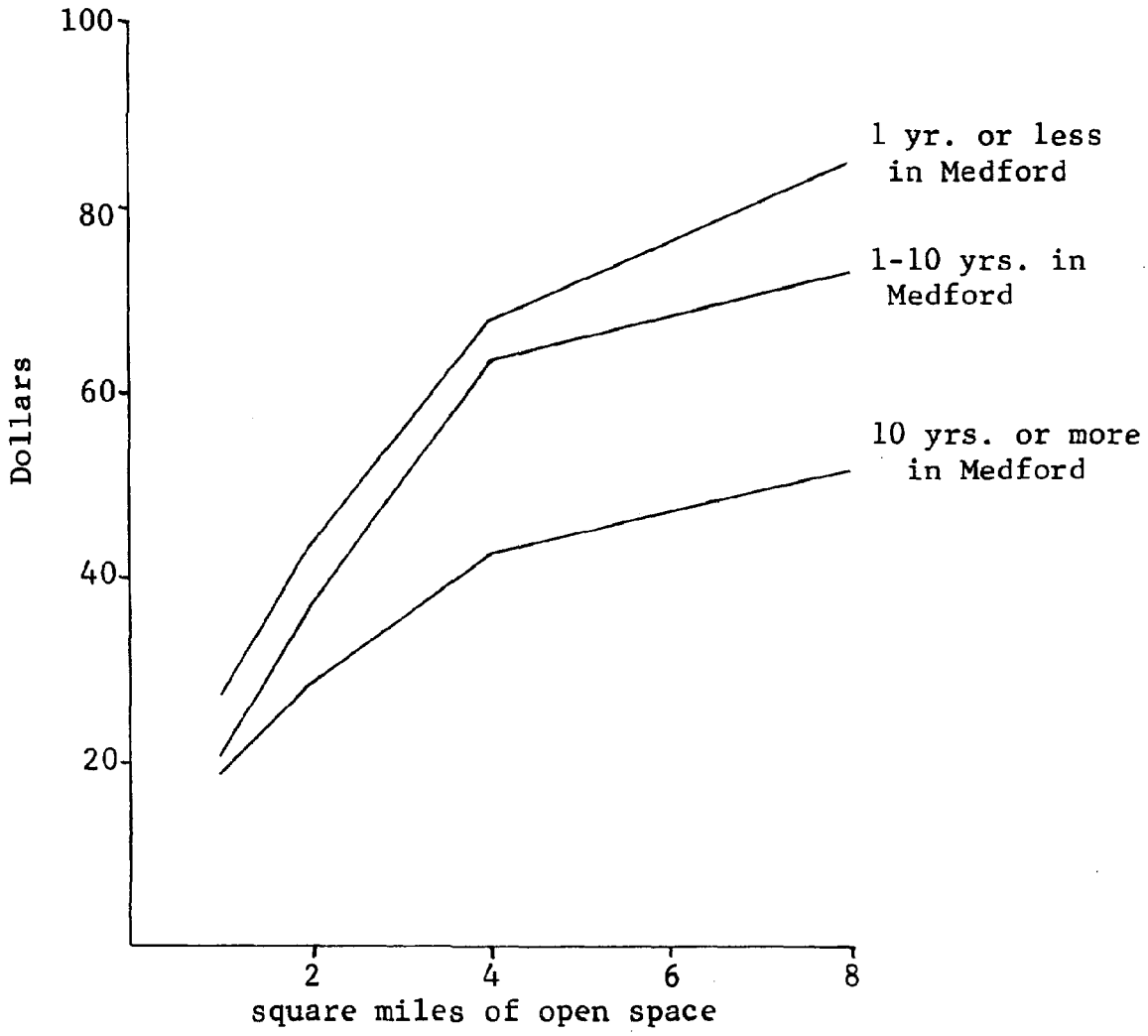


Figure 4. Average household's annual willingness to pay for open space in Medford by length of residence in Medford



to the Mann-Whitney U test on willingness to pay for four square miles of open space inside the Township. That is, new residents (and probably the next few years of future residents) exhibit stronger claims for open space than long-time residents of the area. This can be interpreted to mean that people now moving to Medford are aware of the imminent development of the area and wish to escape the despoilation of the landscape typical of Philadelphia and the inner ring of suburbs. We can therefore expect strong restrictions on development of the Pinelands to be favored by new people living in or near this ecologically valuable area.

(Cynics may also wish to attribute this second regularity to a thinly veiled desire to exclude new residents who might move into Medford Township after the respondent did. In part this may be true, but it is not evident that the respondents seriously believed that they could prevent the growth of the Township by this or any other means. Moreover, why do long-term residents not feel any such exclusionary desires as well?)

Thirdly, Friedman's χ_r^2 test applied to the increments in willingness to pay as acreage increases (measured in dollars per acre) reveals that, at the 0.1% level, willingness to pay for open space increases at a decreasing rate. This means that the

first few square miles are the most important local open space and that additional acres are less and less important, as measured in dollars per acre.

Recall that since these data refer only to local open space we cannot infer that only the first few square miles of Pinelands are the most important statewide. In fact, we can expect that the first few hundred square miles will be the most important. The scale of the Medford study is of a completely different magnitude than a study of all the Pine Barrens would have to be. Local open space and regional open space are different goods, but the methods of measuring consumer demand for these goods are quite similar.

The Medford study revealed something about the motivation of people for preserving open space as well. Asked to rank the uses of open space in Table I as not important, important, or very important, respondents indicated that those uses that could be called environmental protection (Items 3 and 5) were listed as very important far more frequently than those that could be interpreted as scenic amenities (Item 4) or outdoor recreation (Items 1 and 2). Nearly all respondents said most items were at least important and relatively few said nothing was important.

Table I

Use of Open Space	Number of households rating it very important
1. Places for hiking or enjoying nature	25
2. Places for family outings, camping or picnics	20
3. Places where wildlife and plant life can be protected	48
4. Places which break the monotony of suburban development	21
5. Places which protect the water quality of streams and lakes	54

Thus, it can be concluded, very roughly, that preserving open space in this Township along the border of the Pinelands is at present chiefly motivated by a desire to protect the environment. In terms of the Venn diagram in the introduction, the overlap between social claims for open space and ecological claims for open space is fairly large. Whether this motivation will change as the population increases remains to be seen.

(To the extent that people desire open space with much of it to be used for large numbers of recreationists engaged in some form of active leisure, there is a conflict with the preservation ethic underlying this paper. Thousands of canoeing

enthusiasts simultaneously paddling down the Mullica, hundreds of hikers daily assaulting Mt. Misery, or a herd of hunters blasting away at deer and trampling vegetation runs counter to the purist approach. While some areas can be set aside for intensive active recreation with little environmental cost, I do not envision preservation of the Pinelands to mean the establishment of Fantasyland or Coney Island. Infrequent use of the land such as by occasional hikers, will cause little damage to the area, and so I do not suggest that the Pinelands be placed off limits to people altogether.)

The collective strength of the demand for open space in Medford is considerable and will increase as the population increases. If land can be acquired under the New Jersey Green Acres Program (Ch 419, Laws of 1971) where the state pays one-half the cost of the land, the town of Medford can afford to purchase and zone as floodplains (Ch 185, Laws of 1972) approximately 3000 acres of land not now protected as open space. See Figure 5 which shows one possible acquisition plan out of a range of acceptable plans. Table II translates this sample plan into annual costs and willingness to pay for the average Medford household from 1973 to 1985 assuming that the land is purchased

Figure 5. Medford, New Jersey
Sample Open Space Plan

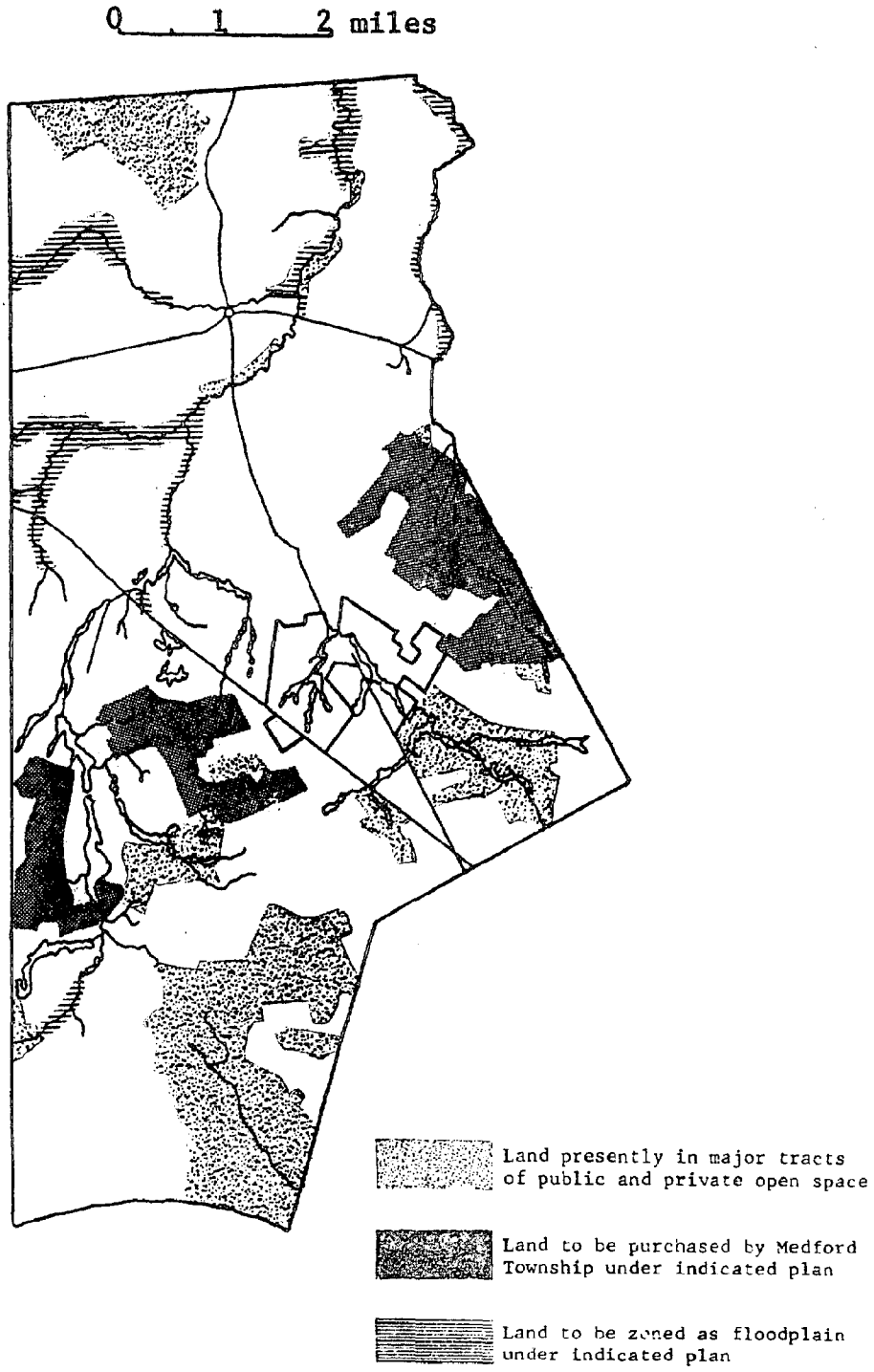


Table II

Total acreage presently in public or private open space in Medford Township .....3639 acres

Total acreage to be purchased in 1973-4 under sample plan .....2279 acres

Total acreage to be zoned as floodplain ..... 695 acres

Municipal bonds to be issued to purchase 2279 acres shown in Figure 5 .....$3,095,000

Interest rate on municipal bonds 6%

Repayment period on municipal bonds .....20 years

Year by Year Schedule of Costs and Willingness to Pay For Open Space (1973-1985)

Year	Cost of Open Space Program to Average Household	Average Household's Willingness to Pay for 2974 acres* of Open Space
1973	$ 65.55	$ 60.58
1974	57.52	63.61
1975	51.24	66.79
1976	46.19	70.13
1977	42.06	73.64
1978	38.60	77.32
1979	35.66	81.18
1980	33.14	85.24
1981	30.96	89.50
1982	29.04	93.98
1983	27.35	98.68
1984	25.84	103.61
1985	24.50	108.79
Totals (current $ 1973-85 only)	$507.65	$1073.05

---

*2279 acres purchased plus 695 acres zoned as floodplain

in 1973 by issuance of $3,095,000 of municipal bonds whose interest rate is 6% and whose repayment period is 20 years. The costs of the open space program to the average household decrease each year because the population paying for open space increases.

A variant on social claims for providing open space is not developing land because of environmental hazards (see Center for Ecological Research in Planning and Design, 1973). Specifically, the threat of fire and the inconveniences of a high water table in some areas would, on the surface, seem to strengthen rational people's claims for leaving much of the Pinelands undeveloped. However, the ignorance of or disdain for fire hazards and the high water table in lowlands is quite remarkable, for houses are being built and occupied in spite of these dangers of future calamity.

Environmental Rights and Decision Making

Let us conclude this brief exposition of environmental rights as related to the New Jersey Pine Barrens by showing how they can be registered and taken into account in a critical decision making process pertinent to protection of the Pinelands. This concerns the government's power to regulate land use (zoning) and the need for compensation of private individuals whose land is regulated. A review of the kinds of legal issues involved may be found in Kingham (1972) and Rose (1973).

Considering environmental rights in terms of the ecological and social claims for preserving open space, it can be argued that the government should prevent environmental damages by regulating what landowners may do with their land. Thus, because development in the Pine Barrens is usually inimical to existing natural processes and to the stock of plants and animals and imposes losses on consumers desiring open space the state should prohibit development throughout much of the 950,000 acres of unprotected Pinelands.

In contrast to this doctrine is the important tradition that a man's property is his to do with as he chooses, including construction of dense suburban housing. Regulation substantially

interfering with this constitutes a taking of that land which, in turn, requires compensation of the landowner to make up for the diminished market value of his land caused by the regulation. The classic statement of this point is Justice Holmes' opinion in Pennsylvania Coal Company v. Mahon et al (260 US 393 [1922]).

Obviously there is a conflict over the rights to ecologically valuable land. Court cases so far have bounced back and forth from the point of view that strong regulation for environmental protection is a taking of land requiring compensation of the owner (see Morris County Land Improvement Co. v. Parsippany - Troy Hills Twp, 193 A2d 232, N.J., 1963 and Maine v. Johnson 265 A2d 711, 1970, both concerning filling of marshland) to the point of view that the public is entitled to protect itself (and nature) from damages produced by land development and therefore does not have to compensate regulated landowners at all (see Just v. Marinette County, 201 NW 2d 761, Wisc., 1972). In the latter approach, only if the public wanted to create new benefits (e.g. by developing for a park) ~~or~~ the land in question could the action be deemed "taking" rather than reasonable use of police power.

Reliance on the polar extremes in these cases seems unlikely to yield an equitable distribution of the costs of environmental

protection. Either the public and nature bear the costs of damages imposed by private landowners or else the private landowners bear the costs of benefits accruing to a large number of other people and to nature. Some kind of partial compensation rule seems necessary to be fair to all parties involved. This rule would, of course, be dependent upon what rights the public obtains from private landowners.

An equitable procedure can be further defined by characterizing the fair price for regulating ecologically valuable land in terms of a "maximin" rule: Choose that compensation which maximizes the minimum "payoff" regardless of which interested party has the minimum payoff. In Rawls' (1971) words, act so as to make the least advantaged party best off.

Before elaborating on this rule we must first review the interested parties and their respective strength of claims. The parties are:

1) Nature -- a multidimensional party with many species,

2) Consumers desiring open space, and

3) Private landowners whose land is ecologically valuable.

Their strengths of claims to the land are, not surprisingly, measured in completely alien terms. They are, respectively:

1) Number of species which could survive over the long run if as much land as possible were protected under the given compensation scheme (including aquatic species whose habitats are affected by urbanization),

2) Willingness to pay for open space, measured in dollars,

3) Market value of land, measured in dollars.

The noncomparability of claims reflects the differences in the interested parties (some of which do not even contain people) and the dissimilarity in their objectives.

Because of this disparity, the costs borne by one of the parties in any compensation scheme cannot be easily offset by the gains or benefits of another. Hence a compensation rule such as "maximize net benefits" makes little sense here. The maximin approach instead says that one party should not have to subsidize the gains of another any more than is absolutely necessary. Why should wildlife suffer because of traditions in land ownership, for example? Or, why should a few private landowners suffer for the benefit of the community at large?

Moreover, to attempt to incorporate benefits as well as costs into the decision making procedure (i.e., to trade off costs borne by one party for benefits of another in some kind

of net benefits rule) is likely to be beyond the decision making ability of most mortals. Stronger interparty comparisons of welfare are required in the "maximize net benefits" technique than in the maximin technique.

Clearly a compromise compensation rule like "the public should pay one-half the market value of the land" will improve the position of the least-advantaged parties in either of the extreme solutions (compensation to make up the difference between full market value and the land's regulated value or uncompensated regulation). In general, however, the decision as to which party is least advantaged under various compensation rules is a subjective one that must be worked out in a series of publicly made and publicly defended judicial, legislative, and administrative forums where all parties are adequately represented.

That the New Jersey legislature is ready to embark on laying a foundation for such a procedure appears to be far in the future. A failure to incorporate environmental rights into the legal system can only mean the undue loss of some Pinelands to suburban Philadelphia and New York and to landward pressures from shore communities.

REFERENCES

Legal Cases cited:

Just v. Marinette County 201 NW 2d 761 (Wisc, 1972).

Maine v. Johnson 265 A 2d 711 (Maine, 1970).

Morris County Land Improvement Co. v. Parsippany - Troy Hills Twp 193 A2d 232 (N.J. 1963).

Pennsylvania Coal Company v. Mahon et al. 260 US 393 (1922).

New Jersey Laws cited:

New Jersey Green Acres Land Acquisition Act, Ch 419 (1971).

Delineation and Marking of Flood Hazard Areas, Ch 185 (1972).

Books, Articles and Reports:

D. Berry and R. E. Coughlin, Economic Implications of Preserving Ecologically Valuable Land in Medford, New Jersey, Regional Science Research Institute, Philadelphia, 1973.

S. Cain, "The Species-Area Curve," American Midlands Naturalist, Vol 19 (1938) pp 573-581.

Center for Ecological Research in Planning and Design, "An Ecological Planning Study of Medford Twp, New Jersey," Dept of Landscape Architecture, Univ of Pennsylvania, Philadelphia, 1973.

R. Kingham, "State and Local Wetlands Regulation: The Problem of Taking without Just Compensation," Virginia Law Review, Vol 58 (1972) pp 876-906.

A. Leopold, A Sand County Almanac, Oxford University Press, New York, 1949.

J. McCormick, The Pine Barrens: A Preliminary Ecological Inventory, New Jersey State Museum Report No. 2, Trenton, 1970.

J. Rawls, A Theory of Justice, Harvard University Press, Cambridge, 1971.

J. Rose, "The Courts and the Balanced Community: Recent Trends in New Jersey Zoning Law," Journal of the American Institute of Planners, Vol 39 (1973) pp 265-276.

Soil Conservation Service, U.S. Department of Agriculture, Soil Survey of Burlington County, New Jersey, 1971.

C. Stone, "Should Trees Have Standing? -- Toward Legal Rights for Natural Objects," Southern California Law Review, Vol 45 (1971) pp 450-501.

ROLE OF GOVERNMENT IN OPEN SPACE LAND MANAGEMENT -- by Michael S. Ontko*

Current Setting for Land Management

In the past few years, we as a nation have come to the realization that there is no longer an unlimited supply of land for our many needs. Competition for land in the eastern megalopolis is manifested in rising land prices, which is accentuated by withholding of land by speculative interests. Such holdings artificially reduce supply and thus increase the cost of available sites. As prices rise however, the economic land use alternatives are reduced. This economic situation, coupled with the recognition of a deteriorating environment, has prompted the trend toward land use management. Open space land management is a part of that larger management system.

The nation has placed great emphasis on solving the problems of water and air pollution. It is, however, land use which holds the key to solving these problems and is the area where we have shown the least success. It is not that we do not realize the need. Public and governmental awareness of the need for workable controls is at an all-time high. Land use management, however, is a more complex problem than air and water problems, which may be controlled at point sources given the proper

---

* The comments presented in this paper are those of the author and do not necessarily represent the official position of the Delaware Valley Regional Planning Commission.

expenditure of money. Undeveloped land, the area for which there is still hope to avoid problems of development, is very poorly controlled. Almost any parcel can be developed. Major limitation of such development would challenge the right of individuals or organizations to receive a fair economic return on their property. The politics and economics of modifying this foundation of American society is an extremely delicate and complex issue since our system places a premium on individual rights over the rights of society in general.

While we reach for a handle on the land use problem, programs for open space acquisition, development, and management remain a low priority item in governmental budgets. It is clear that government at all levels is struggling to reidentify the roles to be played in land management. In the Delaware Valley the greatest land use control powers have been acquired by local governments. However, they have often been relatively unsuccessful at control for a variety of reasons, such as the following:

1. Pressure to acquire ratables to hold taxes down -- inability to resist developments regardless of design or location.

2. Lack of fulltime management -- inability to formulate and enforce controls.

3. Limited area of control -- numerous small minor civil divisions showing individual but uncoordinated efforts.

4. Weak zoning controls -- misguided reliance on zoning and over-use of spot zoning changes.

This is an oversimplification of the problem.[1] These and other inadequacies have led to the suggestion that at least some controls should be imposed at the state level. The National Land Use Policy Act[2] is a response to the lack of successful local controls. By providing incentives to the states[3] for land use planning, the National Land Use Policy Act attempts to promote more systematic and stronger mechanisms for land use control.

It is within this framework that open space land management has grown to importance. There are at least four subcategories of open space that must be treated in such a program.

1. Park and Recreation -- Acquisition and Development
2. Natural Resource -- Development, Conservation, Preservation
3. Historic Site -- Preservation
4. Agricultural -- Conservation and Preservation

Each of these holds individual significance but benefits most from integration into a singular open space land management policy. The remainder of this paper will be concerned with the role of government in open space land management, with special emphasis on applications for the New Jersey Pine Barrens.

Open Space Land Management -- A Problem of Responsibility and Coordination

The Pine Barrens have been defined most broadly by McCormick[4] as occupying about 2,000 square miles of the southern New Jersey coastal plain (Figure 1.) This represents 25.4% of the area of the Garden State, the most rapidly urbanizing state in the nation. A somewhat more restricted delineation has been made by the New Jersey Department of Environmental Protection.[5] See Figure 2.

The Pinelands have many unique natural resources which require extensive and sensitive management. Among these are:

1. The largest freshwater aquifier system on the east coast, composed of the Raritan-Magothy formation and the unconsolidated Cohansey and Perkasie sands.[6] The latter is extremely sensitive since it begins a mere 20' from the surface and is extremely vulnerable to contamination from sewage, runoff, and other development-related sources.

2. The last major freshwater river system on the east coast composed of the Mullica, Wading, Bass, and Oswego systems. This is a major source of freshwater to the Great Bay, which is a significant wetlands area.

3. A major near-natural wilderness area (the Central Pine Barrens). This area supports numerous species of plants and animals, some of which are unique or nearly unique to the area.[7]

Figure 1 New Jersey Pine Barrens

After McCormick

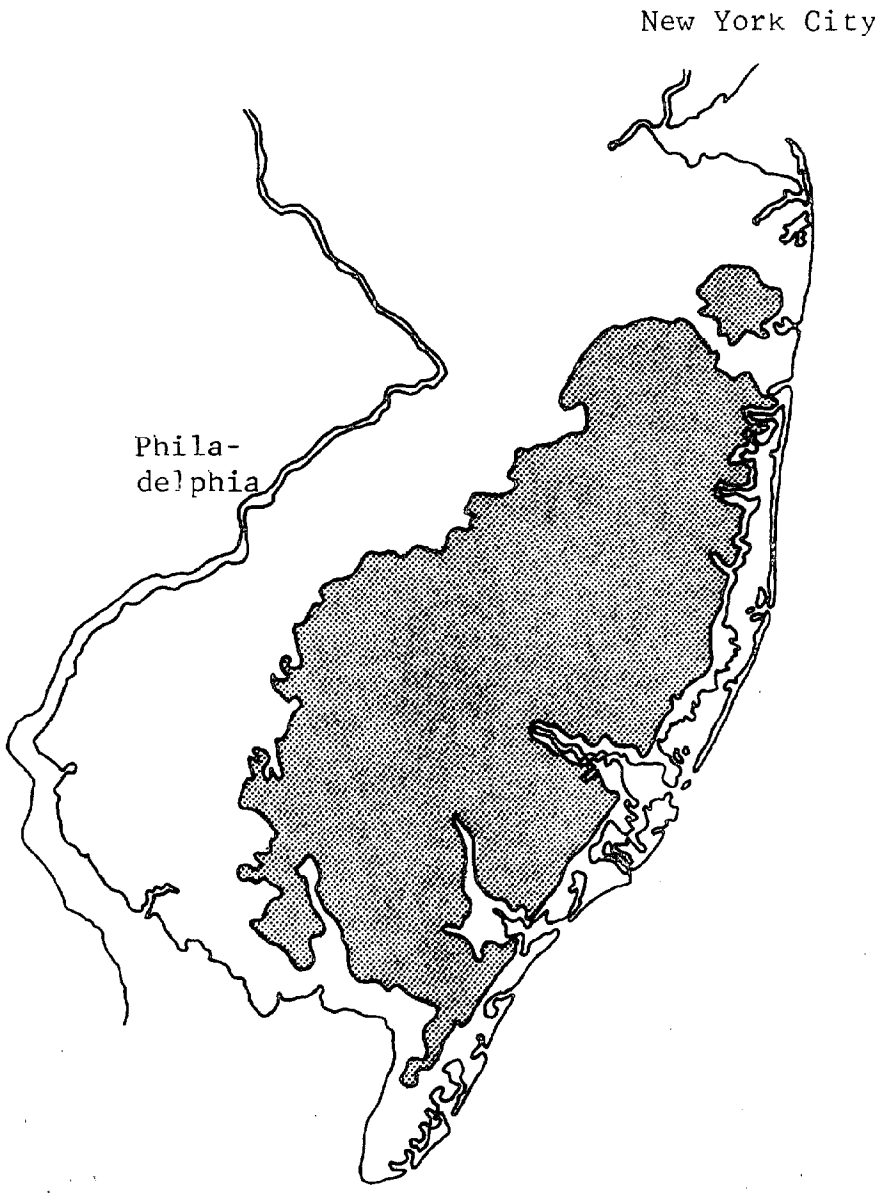
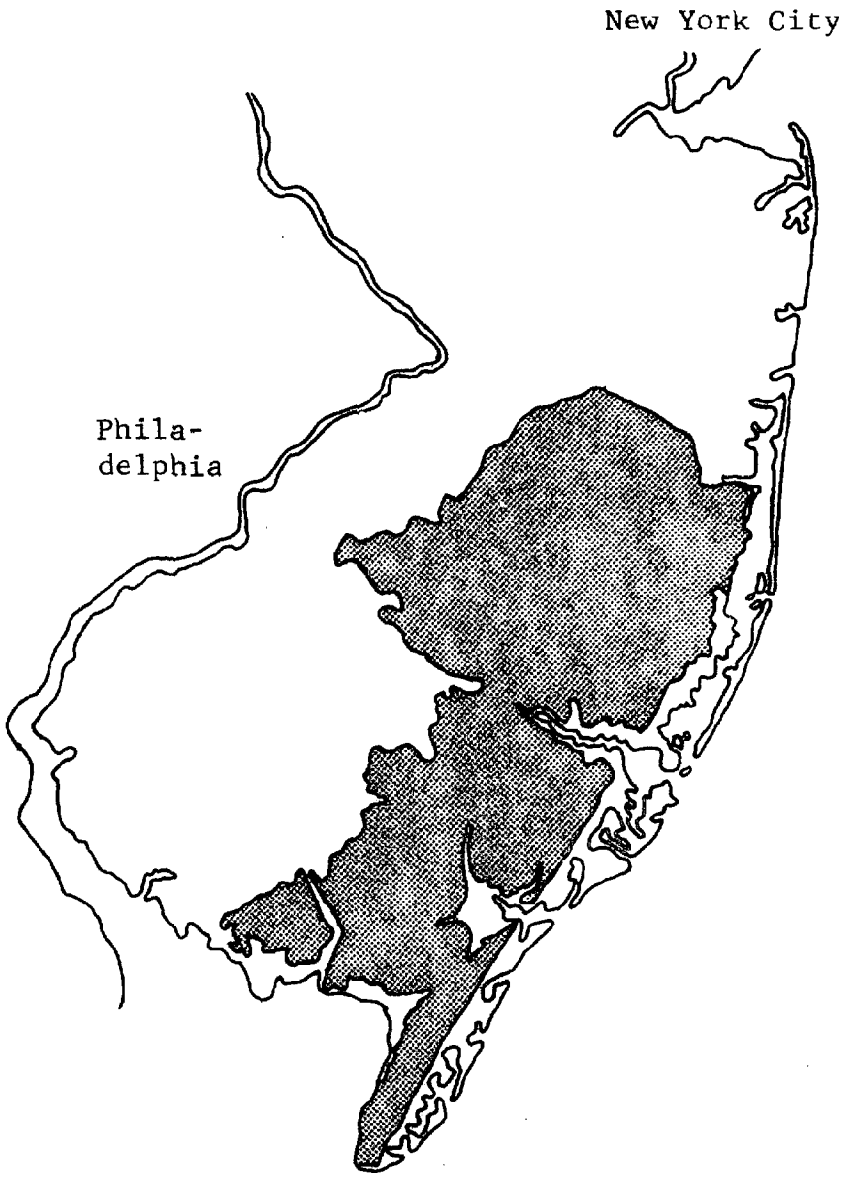


Figure 2 New Jersey Pine Barrens
After Regional Ecological
Map of New Jersey -- N.J.
Department of Environmental
Protection



4. A large area of dwarf scrub oak and pine (the Plains area). These trees are less than 4' in height. This area is extremely sensitive ecologically and vulnerable to fire due to the near drought conditions which exist because water percolates beyond reach of root systems.

A combination of conditions have deterred development of this ecologically sensitive but strategically located area. Some of these conditions have recently changed, thereby endangering a major physical resource.

1. Lack of Access -- The Pines have long been relatively isolated from the immediate development pressures of New York, Philadelphia, and Atlantic City. The construction of the Garden State Parkway, the Atlantic City Expressway and the Lindenwold High Speed Line have penetrated the Barrens and will increase development pressure.

2. Economic Integrity --For many generations, the large cranberry and blueberry farms have helped to preserve the periphery of the Pine Barrens through viable agriculture.[8] The owners of these large productive facilities have expanded their holdings to secure continual supplies of water vital to operations. In addition, the growers seem to act as a cohesive group to help preserve their economic interests from detrimental action. This social and economic system has served to defend the area from encroachment. Should it break down, however, developers will have an opportunity to secure large acreages. New Jersey is extremely concerned about the loss of farmland in the state. Like many other states, it has turned to agricultural assessment[9] as a means of providing tax relief to farming. However, as elsewhere, the penalties for development are not sufficiently severe and speculators are able to use this reduced assessment to help hold land for rapidly increasing prices.

3. Government Lands -- A large part of the Pinelands is in public ownership, primarily Federal and State.[10] Less than 1% of the Federal land can be considered natural.[11] Nevertheless, this framework is being used by the State of New Jersey as a basis for expanding public ownership of the pinelands. This effort in effect is undertaken on a plot-by-plot basis as land comes on the market.[12]

4. Soils -- Sandy soils and high water tables have reduced the desirability of this area for development. As long as land was available elsewhere and pressure for development was less severe, this peripheral area was largely ignored. This factor is rapidly changing and technology can easily overcome this problem. The long-term effects, as we shall see, can cause irreversible problems.

The efforts of government are usually well meant but often a positive action to rectify one problem presents new and unforeseen problems. In 1970, the New Jersey Wetlands Act[13] was passed to preserve the tidal areas so important to food chains. Initial mapping methods to delineate these areas were slow, so remote sensing was applied to delineate the areas covered under this law. It seems likely that this technique will stand the test of legal battle and a large area of wetland may be saved.

If extensive wetlands are preserved, the pressure will mount for development of the Pine Barrens. Development will be forced away from the coast and the Pine Barrens are the next nearest area of available land for second homes with seashore resort access.

The implications of state policy are easier to read than those of the minor civil divisions. The Pinelands include most of Ocean and Atlantic, much of Burlington, part of Cape May, Cumberland, Gloucester, Camden and some of Salem and Monmouth Counties. Scores of townships are included. It is a politically complex area.

No single mechanism exists for communication among the numerous minor civil divisions, 9 counties, and several state government branches which all have separate interests in the status of the Barrens. Burlington, Camden and Gloucester counties are included in the Delaware Valley Regional Planning Commission. Monmouth County is part of Tri-State Regional Planning which focuses on New York City. The remainder has no regional organization among its member governments. The area lacks formal coordination as a singular unit.

Some efforts have been undertaken to improve communications among concerned individuals. The Pinelands Advisory Committee[14] and the Pinelands Environmental Council[15] have been organized to fill the communication gap and investigate alternative uses of this area. In terms of planning by government, however, there are several conflicting approaches which must be resolved.

More important, there must be a concensus of member governments to achieve the goals through local policy and cooperation with the state.

Open Space Planning -- A Problem of Conflicting Values

Like most planning functions, open space proposals are subject to a variety of pressures, each claiming to satisfy the needs of society in an optimal manner. The arguments are debated continually among governments, individuals, groups, and private interests.

Development vs. Non-Development

A century ago, Joseph Wharton acquired a large tract of Pine Barren land for its water resources with which he proposed to supply Philadelphia. The plan was abandoned when New Jersey legislation was passed prohibiting interstate transfer of this valuable water resource. Recently, several development proposals have been designed for the Pine Barrens,[16] including one which proposed a large jetport to serve the east coast.

The use/non-use issue is oversimplified. The real issue is degree of use which can be permitted. Although the Pines are thought to be a relatively homogeneous area, this is not the case. Certain portions should be preserved in a natural

state while other sectors may be developed in varying degrees dependent upon specific conditions. The Pinelands should not be further interrupted until these areas are specified.

Recreation vs. Wilderness

Recreation and conservation interests differ greatly on the potential use of this area. Were it to become entirely within the public domain, it would be difficult to justify retention of the entire area in natural state. Increased population, higher disposable incomes, more leisure time, and changing social values have increased the need for recreation services. However, the fragile ground cover and ecological systems could be easily upset by heavy recreational use.

Access again is the key to management. Although large numbers of people are turning to hiking and back-packing as a form of recreation, most visitors will remain relatively close to facilities. A combination of careful placement of access and facilities and designation and enforcement of restricted areas could be used to control the adverse effects imposed by visitors.

Local Rights vs. Common Good

With an area as large as the Pine Barrens, any major proposals must cope with local reaction. In many parts of the Pines local sentiment is overwhelmingly opposed to any major changes in the status quo. Bass River Township, for example, has repeatedly opposed a major development project for several years in defense of the status quo and at the expense of losing precious ratables which other communities seek so eagerly. Five-acre zoning has been a common technique for supporting agriculture and resisting development. But this technique, when used for an entire township, could be overturned by the courts as exclusionary.

If extensive areas are to be acquired, they would serve state and regional needs. Local governments would be expected to object to the resulting loss of ratables. Close coordination between different levels of government will be necessary.

Implementation -- A Need for Many Techniques

Were the money available and sellers willing, the pinelands could be purchased for a sum of 1 billion dollars.[17] Although that would be most desirable, such a large sum is not likely to be available for open space. More modest and more realistic approaches should be taken.

Even modest purchases will not be easy at present since the HUD Open Space Land Program is under moratorium and the BOR Land and Water Conservation Fund is diminished to 1/3 of its budget for last year.[18] Historic sites in the pinelands could be acquired or improved through the Department of Interior Historic Preservation Act.[19] The New Jersey Green Acres program is being used to purchase land when it becomes available and a 3,000 acre site[20] is now being considered.

Beyond the modest national and state programs, little money is available for purchase of land for open space. Therefore, government should resort to less costly measures and regulatory controls to achieve the desired results.

Implementation can be effected through the application of various tools by the governments and their various departments. In addition, numerous private institutions, organizations and individuals can be encouraged to participate in the acquisition and maintenance of open spaces to supplement the inventory of public facilities. Each tool has specific advantages and disadvantages and its application must be evaluated on a project-by-project basis. Governments must use the methods which best meet their needs. Implementation techniques and the types of areas to which they are most applicable are summarized in Table 1.

Table 1

Implementation Techniques for Open Space Planning

Technique	Most Appropriate Application				
	Park & Rec.	Nat. Resource	Historical	Agricultural	Dev Constraint
1. Purchase - Fee Simple	X	X	X		
2. Purchase & Leaseback		X		X	
3. Easement Purchase	X	X		X	
4. Purchase Option	X	X			
5. Tax Relief				X	
6. Donation	X	X	X		
7. Zoning - Minimum Standards	X	X		X	X
8. Subdivision Review					X
9. Contractual Agreements	X	X			
10. Condominium - Minimum Standards	X				X
11. PUD-PRD - " "	X				X
12. New Towns - " "	X				X
13. Transfer of Development Rights		X		X	X
14. Protective Covenants					X
15. Land Trust		X		X	

In addition to the techniques mentioned in the Table, preservation of wetlands is a classic example of regulation designed for a functional area. Its success in this case is partly related to historic rights of the state to wetlands. No such historic claim can be used to preserve the Pine Barrens. State control of water resources, however, can be used as leverage to control development which would directly affect ground water quality. Legislation controlling development of flood plains and stream valleys could assist in control through water quality management.

In the past, developers have been able to gain approval of projects which later require provision of utility services. Currently, the provision of such services is controlled by minor civil division governments, utility authorities and utility companies and are not always well planned or coordinated. Strict control over extension of water supply, sewerage, sewage treatment, paved roads, and electrical supply can be used to control development. A stronger role for state, regional, and county governments is suggested.

In addition to the selection and activation of an implementation strategy, municipalities should prepare capital investment

programs which allocate funds for open space acquisition and development. Many municipalities have already established such procedures. Since open space is often a relatively low priority item in municipal budgets it is often the first sacrificed under emergency conditions. Capital Programming can assist in the allocation of funds and help assure availability of resources for open space acquisition and development.

Elements of a Program for the Pine Barrens

Since it is unlikely that it will be possible for the public to purchase the entire Pine Barrens, and perhaps it should not all be purchased anyway, a possible strategy for maximizing the utility of this resource might go something like this:

Legislative Controls:

1. Enforcement of the current Wetlands Act of 1970.
2. Extension of controls to non-tidal wetlands.
3. Emphasis on flood plain legislation.
4. More stringent yet attractive agricultural assessment.
5. Creation of Pinelands Regional Coordination system.
6. Compliance with Federal Water Pollution Control Act of 1972.[21]
7. Use of the Endangered Species Act of 1973.[22]
8. Use of the National Land Use Policy Act if passed.
9. Use of the Wild and Scenic Rivers Act of 1968.[23]

Planning:

I. Inventory

1. Identification of critical natural resource planning elements.
    a. Geological -- consolidated and unconsolidated geological structure.
    b. Physiographic -- significant physiographic features and areas.
    c. Hydrological -- surface and ground water and aquifer recharge.
    d. Vegetative Associations -- major communities and sensitive areas.
    e. Soils -- prime agricultural and problem areas.
    f. Fauna -- animal habitats.
    g. Climatology -- variation in microclimate.
2. Identification of Historic Sites.

II. Program

1. Preservation of critical natural resource areas.
2. Preservation of historic sites.
3. Agricultural preservation program.
4. Park and Recreation acquisition and development program.
5. Establishment of planning coordination among concerned governments and citizens.

All these factors should be integrated into an Open Space Land Use Plan with development constraint land management policy. A strong geo-science data base should be created. The use of

remote sensing can greatly facilitate the collation of data for these purposes on a manageable, consistent, economic and regular basis.

Implementation:

1. Purchase of highly critical areas, such as the Central Pinelands and the Plains areas.
2. Expansion of state parks when land and funds are available.
3. Conversion of Federal surplus lands that may become available into the state management system.
4. Use of other implementation techniques listed in Table 1.

These and other procedures can be used to preserve this very unique and valuable resource area for a multi-use system which places utility on assets and recognizes the seriousness of environmental considerations. Multi-use can tie together elements which can not justify preservation on singular terms.

Summary

Land use is perhaps the most critical factor in our total environment. Control of land use patterns can be effective but the implementation of equitable mechanisms are extremely complicated and delicate. Strategies for control should be oriented around the roles of natural phenomena. Open space

preservation and conservation is part of this strategy and must play a larger role in governmental action than has been demonstrated in the past. The Pine Barrens represent an opportunity to devise effective open space land management before large-scale development has complicated the situation.

Footnotes

1. See Thompson, Wilbur, Preface to Urban Economics (Baltimore, 1969), Chapter 7 "The Urban Public Economy: Problems in Scale and Choice" for detailed description of potential interrelationships.

2. The Land Use Policy and Planning Assistance Act (S-268) sometimes called the Jackson-Udall bill.

3. This bill provides $100 million per year for 8 years for the development of state planning processes, state planning agencies and state land use programs. An additional $15 million per year would go to states for land use planning in interstate regions.

4. McCormick, Jack, The Pine Barrens - A Preliminary Ecological Inventory (Trenton, New Jersey 1970) p. 10.

5. New Jersey Department of Environmental Protection, "Regional Ecological Map of New Jersey," 1973. The State of New Jersey is separated into 15 ecozones characterized by homogeneous interrelationships of soils, land farms, vegetation, geology, drainage, and land use and plotted on an ERTS mosaic. This delineation differs from McCormick's primarily by separation of the Vineland mixed agriculture and forest area which the DEP version considers to be separate from the Pine Barrens.

6. Rhodehamel, Edward C., "A Hydrologic Analysis of the New Jersey Pine Barrens," U.S. Geological Survey, U.S. Department of the Interior, 1966. This study details the groundwater capabilities of the pine barrens.

7. McCormick, Op. Cit. The curly grass fern is nearly peculiar to the pine barrens. The area does however contain an unusually large variety of species as well as unusual combinations of vegetative types.

8. Farming is sufficiently extensive as to have helped disqualify the pine barrens as "wilderness area." National Park Service - U.S. Department of the Interior "The Pine Barrens of New Jersey - A Study of Alternatives," Feb. 1969 - unpublished report.

9. There are several New Jersey Farmland Assessment Acts: S-44, S-1081, S-1159, A-1268, S-620, A-2263. They generally call for lower agricultural land assessment to encourage continued production.

10. State of New Jersey owns 162,000 acres. Federal government owns 45,000 acres. The combined acreage (207,000 acres) accounts for about 18% of the pine barrens.

11. McCormick, Jack, Op. Cit., p. 11.

12. The New Jersey Green Acres program provides state funds for acquisition and development of land for parks and recreation.

13. The Wetlands Act of 1970 requires a permit to modify the natural environment in tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water or capable of sustaining certain named species of plants.

14. The Pinelands Advisory Committee was created by the National Park Service at the request of freeholders from Burlington and Ocean Counties to insure local input into potential plans for the area. The first meeting was held on Dec. 16, 1968. A manuscript publication entitled Report of the Pinelands Advisory Committee was published in July 1970.

15. The Pinelands Environmental Council was formed through state legislation A-2096 in response to recommendations for such a group by the Pinelands Advisory Committee.

16. Smith, Herbert H. and Associates for the Pinelands Regional Planning Board Future Development Plans - The New Jersey Pinelands Region (Trenton, 1964) 41 pages. See also, Coughlin, R. E., and Thomas W. Langford, Relative Economic Effects on Penjerdel of Two Alternative Jetport Proposals in New Jersey, Report to Committee Hearing on Regional Development, Phila: R.S.R.I., June 1969.

17. With 207,000 acres of 1,164,000 acres already in public ownership and the remaining 957,000 to be purchased at the modest price of $1,000 per acre, the total cost would be $957 million.

18. BOR Land and Water Conservation Fund
    1973 - $150 million nationally
    1974 - $ 66 million nationally

    This grant provides matching funds for acquisition and development of public outdoor recreation areas and facilities. Grants are made to states and through them to local governments to finance 50% of all allowable project costs.

19. The Historic Preservation Act of 1966 provides Federal matching funds for the acquisition and preservation of historic sites listed on the National Register.

20. The proposed site includes an operative cranberry bog which would be kept active as part of the acquisition.

21. The Federal Water Pollution Control Act of 1972 is designed to restore the chemical, physical, and biological integrity of waters.

22. The Endangered Species Act of 1973 is designed to preserve plants and animals facing extinction.

23. The Wild and Scenic Rivers Act of 1968 is designed to assist in the implementation of preservation of selected rivers of the nation which possess "remarkable recreational, geologic, fish and wildlife, historic, cultural, and other similar values...."

COMMENTARY I -- by Gene Steiker

Environmental issues should not be made to sound unnecessarily complicated. Although ecological processes are complex and effective solutions to environmental problems are difficult to devise and implement, problems may be confronted in a straightforward manner. In discussing the preservation of a wilderness area like the Pine Barrens, basic questions must be resolved pertaining to: 1) the nature, extent and causes of the problem; 2) the specific goals that are to be set for environmental quality; 3) whether or not these objectives can be justified; and 4) strategies that will be effective in producing the desired results.

The problems involved in preserving the Pine Barrens are clearly defined in the two papers. The Barrens are a valuable and delicate ecological system that may be ruined irreversibly by almost any type of human encroachment. Michael Ontko points out the danger of recreational uses without adequate planning as well as the danger of development for housing and industrial purposes. The danger to the Pine Barrens is an imminent one. Existing controls and institutions are inadequate to control development due to fragmentation of political jurisdictions,

lack of coordination between government agencies and conflicting goals. There is a need for both regional planning and coordination of policies in order to rectify this situation. The framework of property rights is central to this issue.

In his paper, David Berry identifies demand for open space, demonstrates a method of measuring what he defines as social demands, and discusses decision criteria used to resolve questions where the interests of different groups conflict. He describes two principal justifications for preserving open space: "social claims," which are the demand for scenic amenities, outdoor recreation and environmental quality and "ecological claims" which are based on the rights of living things to live, independent of any use or pleasure humans may derive from their existence.

The concept of ecological claims is particularly important. We may have to reject many of our present ideas about economic growth and our relationship to nature if we are to have a livable environment. See Roszak (1973) and Boulding (1966). The idea of ecological claims is implicit in the thoughts of many environmentalists and is possibly the only justification for maintaining an adequate amount of environmental protection.

This is not to say that environmental considerations necessarily conflict with economic goals. Social claims may

be underestimated, as they are difficult to evaluate and are only infrequently registered in economic markets. A basic principle of economics is the law of diminishing marginal utility which states that as more of any good is consumed, additional units of the commodity are worth less to the consumer. According to this reasoning, one would expect increases in consumption of economic goods in general to be less and less important as society becomes wealthier. The theory works in reverse as well. If, as appears to be the case, the production of additional goods and services to supply a larger population with higher levels of consumption is achieved at the expense of environmental quality, environmental goods will become more scarce and more valuable relative to consumer goods. There is no reason why environmental objectives should not be gained at the expense of economic growth.

Berry's empirical findings support this hypothesis. The survey of Medford residents revealed a substantial demand for open space. Furthermore, open space was evaluated like other goods to be consumed. Less value was given to additional acreage as more land was preserved. People with higher incomes bid more for open space than those with lower incomes. People

who had recently moved to Medford were willing to pay more to preserve open space than those who had lived there for many years.

The last observation is somewhat disturbing. The recent arrivals had previously experienced less open space amenities and so valued them a great deal, but it seems that the people who were used to these same amenities had a tendency to take their good fortune for granted. As Michael Ontko pointed out, it may often be necessary to put the "common good" ahead of "local interests" in order to preserve the environment. This is also an interesting, but not surprising, insight into the views of those in developing nations and economically disadvantaged areas in this country.

Although Berry's method for measuring demand worked quite well it unfortunately may not be applicable for many other problems. In the case of environmental quality, what people are willing to pay may often depend on how well they perceive and understand what they are buying. Certain types of air pollution, for example, may be damaging to health but not recognized as such.

People also tend to lack interest in things that do not directly affect them or that they feel they cannot control.

One might have difficulty evaluating environmental problems like the effects of energy generation on worldwide meteorological conditions, for instance. Even given perfect knowledge, adequate understanding and ability to evaluate problems fully, there is no guarantee that the amount of environmental preservation that can be purchased after aggregrating everyone's demand is adequate ecologically or even in relation to what may be generally considered desirable on the basis of social claims. The methods used in Medford measure only social claims. Accounting for ecological claims requires the type of study suggested by Michael Ontko for the Pine Barrens to specify the amounts of critical natural resource features that would have to be protected in order to insure the continued existence of plant and animal species and other natural processes.

Such a study is essential for any serious effort to save the Pine Barrens from destruction. A lack of specific goals can be an impediment to achieving environmental objectives. It is one thing to say that the Pine Barrens should be saved and quite another to say exactly what should be done. This would seem to be a topic for geographers to explore. The project should not present insurmountable problems. Emphasis

would properly be placed on defining areas adequate in size and configuration to preserve all the valuable ecologies in the Barrens, rather than on extremely detailed descriptions of the natural processes occurring in the area.

Of course, it is quite another thing again to produce results, and perhaps this is the most difficult problem. Ontko gave an excellent description of the political difficulties involved in saving the Pine Barrens, a comprehensive survey of the controls that are available to curb development, and an outline of a practical strategy that may be effective in managing the resources of the area.

What seems to be absent when the problem of preserving the Pine Barrens is discussed is some social or institutional mechanism to register the demands for environmental quality and evoke a supply response. Much of the problem is related to the nature of environmental goods in contrast to economic goods. One distinction is the "public good" aspect of open space.

Another difference that may be significant is that environmental quality in many cases requires an absence of human activity, rather than any effort similar to that required to produce almost all economic goods. Certain environmental

goods may be produced in the usual way (for example, zoos preserve rare animal species, and there are game preserves run profitably as tourist attractions), but no one is going to get rich preserving the New Jersey Pine Barrens. Consequently a lack of motivation exists. The combination of the need for both collective action and prohibition of activity makes the problem extremely difficult.

My only criticism involves some rather peripheral points. Successful planning requires a clear understanding of the economic forces that govern land use. Mr. Ontko refers to the scarcity of land as being "partly artificial since we, of course, have enough land for our economic needs." Surely there is plenty of acreage in the United States. Land, however, embodies different attributes that are relevant to its suitability for different uses. Not the least important attribute of land is its location in relation to markets, jobs, transportation, and production facilities. Local and regional land markets may be delineated and the price of land in such markets is determined by supply and demand conditions. Scarcity is considered to be the normal state of affairs in economics and the reason for allocating resources. Market mechanisms perform

the function of allocating resources to alternative uses. A shortage would exist only if price could not adjust properly and more land were demanded at a given price than could be supplied. An unlimited supply of land would imply a price of zero, and there would be no reason to be concerned with allocating land to different functions. Although such a condition may still exist in some remote areas it is not typical of the Eastern parts of tne United States.

At another point he says, "As prices rise, however, the economic land use alternatives are reduced." Again competitive market mechanisms under ideal conditions insure the efficient allocation of scarce resources. If the market fails to account for significant demands, such as public demand for open space, because collective action necessary to effect such demands is absent the configuration of land uses decided by the market will be less than optimal. The role of government may be viewed as augmenting the market and providing an institutional framework to correct the market allocation in such a situation. If such collective action is taken but the collective bid for land is not adequate to purchase land, other uses are more valuable to society. However, tne usual governmental and collective valuation

of the land has traditionally been made on the basis of only "social claims" and efficiency criteria. Government planning should also include attention to "environmental claims." Berry's paper presents a maximin procedure for such decisions based on considerations of equity rather than efficiency. This approach may lead to quite different and more desirable allocations of resources.

The comment is obviously meant to apply to the fact that rising land prices tend to tax government ability to exercise land use planning under existing programs. While this may be true, it may imply a lack of responsiveness to environmental and social claims for open space. If there is widespread public demand for open space and other types of environmental amenities then any changes that increase government sensitivity to public desires will be useful.

Finally, I might add one suggestion to the inventory of policies and legislation. It was mentioned that preservation of open space is hampered by local governments competing for development and that municipalities should be compensated for loss of revenues when land is acquired by state or regional programs. Perhaps changes in government revenue collection

methods might be helpful. If the state levied all property taxes and allocated the money to municipalities, the local pressure to compete for ratables would decrease and a major impediment to cooperation would be removed. This idea has been considered in New Jersey for entirely different reasons (namely equalizing the quality of education offered in different municipalities and making property taxes more equitable). Other variants of the idea might be selective regional, state, or federal taxes in addition to local taxes applied to control development.

References

Boulding, Kenneth E. "The Economics of the Coming Spaceship Earth," in Henry Jarrett, ed., Environmental Quality in a Growing Economy, Johns Hopkins Press, Baltimore, 1966.

Roszak, Theodore. Where the Wasteland Ends, Doubleday & Company, Garden City, New York, 1972.

COMMENTARY II -- by Dick Scott

As a resident of "South Jersey" who is at least moderately informed concerning the high and increasing "pressure" the area is under for suburban development, I should like to commend the organizer of this series of papers for selecting a topic that is of prime importance to all residents of the Greater Philadelphia Metropolitan Area. Hopefully, there is still time to avoid the "Cherry Hillization" of the Pinelands, and for that matter, other valuable natural and agricultural areas of Southern New Jersey. Frankly, I am not optimistic. Simple geography leads one to the conclusion that the already high level of pressure for further urban development in the South Jersey area will reach extreme levels in the near future.[1] Most mechanisms that would offer the possibibility of limiting, or channeling this development are still in the discussion or planning stages.

Comments on Berry's Paper

Comments concern three aspects of Berry's paper. First, I will make a few points related to the "man-nature" philosophy underlying the paper. Second, I have a few questions concerning Berry's interpretation of his questionnaire data on willingness to pay for open space. Finally, I will comment briefly on Berry's ideas concerning just compensation to landowners for land taken for public use.

Underlying the preservationist thrust of the paper is a particular view or philosophy of the character of the relationship between "man" and "nature." Here, two possible views of the "man-nature" relationship will be outlined, and the implications of each view for "development" of natural areas will be discussed. One possible view of the relationship between man and nature is that the two are separate, but interacting entities. Man and nature are distinct. This standpoint, I believe, comes closest to the philosophical thrust of the first part of Berry's paper. Here, nature is to mankind something which is "out there," a single part of the total human environment. In this view, the world may be divided into two types of areas: 1) those places that have been molded significantly by the hand of man, and are, therefore, not a part of nature,

and 2) those places that are relatively "untouched" by human hands, and are, then, a part of the natural world. Operational definitions of "natural" and "human" areas are matters that need not be considered in detail here, but such definitions would certainly become central issues in any attempt to formulate, or implement a preservation policy for the Pine Barrens based on arguments having a philosophical root in this view of man-nature relationships.

If one argues, as Berry does, that in the Pine Barrens, plants and animals "merit protection because they exist there and have existed there for some time in harmony with each other and their physical environments," and that, "The right to continued existence with minimal human intrusions is based on this natural occupation of the land," then one is, at least implicitly, accepting a world view in which man and nature are separate -- though possibly equal. Anyone who supports the notion that on the one hand man is distinct from nature, and that on the other hand nature has equal rights to continued existence and non-interference from humans also supports a spatial status quo whenever the question of development of a natural area occurs. Restated in terms of the twofold division

of the human environment outlined above, Berry's view is that those areas of the earth defined as natural have equal rights to exist along with those areas of the earth that are designated as non-natural (man-molded). Additionally, since natural and non-natural areas have equal rights to continued existence, then neither should invade the territory of the other, and thereby transform that territory into the opposite state. This view further requires that one forget history, or that one consider the expansion of the area of the earth settled by man, which has been necessary as a result of the growth of the human population throughout history, to be interpreted as a continual immoral onslaught by men determined to diminish the area of the earth that nature has an equal right to claim. While the position of "equal rights" for nature is commendable in principle, it is an extreme view, and will never be workable in practice -- especially in a place exposed to extreme development pressures.

There are several practical problems involved in any development or preservation policy based on a man-apart-from-nature world view. First, is the definitional problem already mentioned, and the regionalization problems which would flow

from definitional difficulties. Second, use of this world view in formulating decision criteria for development versus preservation may result in the failure to consider other factors which should be given equal consideration. For example, if one uses this world view as a basis for development decisions, then one knows that "natural" areas must be left untouched, and that any development must, therefore, take place in man-formed regions. But this view only tells us that man has a right to build in "his" area; it fails to tell us which parts of the "man-formed" region we should build upon. Should we use parks, or farmland? In short, overreliance on preservationist-based decision criteria may lead to neglect of factors which should be considered the equal of "nature's rights" in making development decisions.

Berry's ecological claims for protecting the environment raise some interesting questions concerning the "state of nature." For example, he claims that plants and animals exist in harmony with each other, and with their environments, and these plants and animals have a "right to continued existence" which is "based on this natural occupation of the land." Is nature really so harmonious? Is it not a fact that the continued

existence of those species present in the Pine Barrens precludes the existence there of other species which could thrive in that environment if certain predators or competing species were removed. In short, this view of the condition of nature requires one to accept the mix of species found in a "natural area" as the best possible mix for that area. This acceptance of the status quo is, seemingly, based on ecological arguments relating to balance and harmony in nature. One question raised by this view relates to the possibility that careful human interference in the ecosystem could improve the symbiotic relations of the flora and fauna of the Pine Barrens, and increase the biomass in the process. Rational evaluation by humans, and possibly human interference may improve on the work of "mother nature." A second question concerns the claim that balance and harmony exist among the species of the Pine Barrens. While it is claimed that the ecological claims are "not anthropocentric", one wonders about things such as "harmony." Is this not, at least in part, an anthropocentric, possibly even romantic, view of an ecosystem. Would not a specification of relationships among system elements define the "nature" of the place better than claims about "harmony."

If the view that man and nature are separate has shortcomings (not the least of which is the inherent anthropocentricity which results when we separate man from the system and assign him to the role of viewer of the world) as a basis for formulating developmental policies, then a logical next step would be to examine other possible views of the man-nature relationship, in terms of suitability for a basis of development policy. One obvious alternative, which on the face of it seems to overcome the inherent anthropocentricity of the view previously discussed, is to consider man to be an integral part of nature. Here one may still discuss the "environment" of man, but that discussion will proceed from the standpoint of the relations between one element of "nature," man, and the environment in which man lives. Any other element of the natural system could be discussed analogously, and in the latter case man is a potential member of the "environment."

The "man as part of nature" view, though, is also problematic. First, as far as we know, humans are basically different from other animals and plants. We compulsively organize and systematize what we see, and we communicate extremely complex messages via language. In these ways we differ, at least in degree, from

other organisms. Also, most westerners view "man-nature" as a dichotomy. For this reason the dichotomist view may be a useful analytic device whenever one is attempting to understand the behavior of humans in relation to their environment. That is, if most western men believe themselves to be apart from nature, and if they behave accordingly toward nature, then one mignt profitably adopt the "man-nature" dichotomy in research.

In the final analysis, unless there are reasons indicating a need for adopting an anthropocentric view, it seems that logic beckons one toward the world view which places man in nature. We are, after all, part of the web of life, and we have a biological continuity with living things that goes back millions of years. If one maintains that we are not a part of nature, then it is necessary to explain when and how we became separate. One may object, "but we have culture," and I would respond to this that culture is as natural to men as honeycombs are to bees. On the one hand, culture is part of our behavior, and other animals do not seem to exhibit behaviors encompassed in the usual definitions of culture. On the other hand, the organisms we so easily place in a single class under the rubric "nature" exhibit an extremely wide variety of behaviors. Certainly, the

fact that men have culture separates us less from some of the animals usually considered to be a part of nature, than those species are separated, in terms ot behavior, from other animals and plants. Those who are closest ought to be in a similar class.

If one feels compelled to adopt a world view in wnich man is considered as an element of the natural world, then the next logical question in tnis dıscussion is, "what kinds of principles for development decision criteria would such a view suggest." If man and his culture are part of nature, then his interactions with his environment are natural acts. The fact that man may destroy part of the land or the creatures and plants living on the land, in the process of getting land on which to play or live is, in this view, no more "unnatural" or wrong than the fact that the current flora and fauna of an area may exclude other living things which could survive in the environment in that area. That man behaves as a predator is, in this view, no more "wrong" than the fact that rabbits must die if eagles are to fly. Any act of man is part of the "natural harmony" existing in nature. By now it must be obvious that this second view is useless as a guide to making decisions about developing any part of the earth surface. The only possible guide would

be as follows: Whatever men do to the environment is acceptable because any acts are in the natural order of things.

In summary, neither view (man as separate from nature, or man as part of nature) taken by itself seems very useful as a guideline for decisions related to the development of an area. The first, man as separate from nature, leads logically to decisions in favor of a spatial status quo whenever the question of the development of a natural area is faced. The second view, man as a part of nature, seems to allow no sins on the part of man. All types of development consist of natural acts, and are therefore in harmony with the environment, and allowable. The entire earth may be covered with McDonald's stands and other noble accomplishments.

Evidently, development decisions need to be based upon criteria other than various types of claims for environmental protection of the "natural world." However, these claims need not, nor should not, be excluded from consideration. Just what the "other criteria" ought to be need not (thankfully) be of concern here, except to say tnat it is an issue that needs (and is getting some) frank,honest, open discussion, and solid thinking.

I would now like to turn to a brief discussion of some of the Medford questionnaire findings. Berry's second statistically significant regularity is that the longer a person lives in Medford, the less he is willing to pay for preserving open space. It is suggested that this regularity probably occurs because recent settlers are more aware than long-term residents of the types of suburban sprawl problems associated with the "inner ring of suburbs" around Philadelphia. I have no quibble with this interpretation but do have a few questions. One, was income held constant among new, mid-length, and old residents? It is possible that newer residents have higher incomes than older residents and because of this income difference are willing to pay more for open space.[2] Two, it is also possible that older residents are holders of larger tracts of land than newer residents. Those who already "own" considerable open space may frown on paying increased taxes to preserve that commodity as a public good.[3] Additionally, those who own large tracts of land may view any attempt to create public open space as a threat to the profit they might gain if the land were sold to a developer. One expects that the holder of 100 acres of potentially developable land would be less than enthusiastic about potential restrictions to future development of that land

whether the restriction comes as a program to preserve open space, wilderness, or agricultural lands. This source of resistance,of course, may be neutralized by various programs to remunerate landholders for all or part of these potential losses.

Final comments concern Berry's excellent discussion of the intricacies and difficulties involved in decisions relating to compensation to various interested parties. The development of philosophical, theoretical, and practical knowledge concerning "development rights" and compensation is crucial and Berry has made a creditable start in this direction in the brief final section of his paper.

Comments on Ontko's Paper:

It is well known that of all the states, New Jersey has the highest population density - roughly 1040 persons per square mile. As is usual in those states which have urban-industrial economies, the population is highly concentrated in space. This means that relatively small areas of the state have densities far above average, while large areas are very low in population density. One's mental images of New Jersey as an urban, strife torn continuous city, are forever shattered upon a first visit to the Pine Barrens, or for that matter to any of the state's agricultural areas. There is a lot of open land out there, and there are obviously development designs for much of that land. William H. Whyte's warning signs of land being held for speculation are rampant in South Jersey -- grown up fields, abandoned orchards, and the ubiquitous "LAND FOR SALE" signs. Just as there are developers who would turn all of South Jersey into one great housing tract, so also are there proposals around which advocate the preservation of much of the state's remaining open space.

"Keep agricultural land agricultural" says the Commission on a Blueprint for Agriculture, which has suggested that a tax be levied on real estate transactions in order to provide revenues

which would enable the state to purchase the development rights to 1,000,000 acres of New Jersey's farm land. This is a noble goal. Farming is a very important industry in the state, and certainly "run away" development could do (and is doing) harm to the agricultural sector of the economy.

The Pine Barens also have advocates who wish to protect this valuable resource from further development. Possibly, a million acres of the Pine Barrens should be left undeveloped, or at low densities of development. Finally, the remaining undeveloped tidal lands of the state are, hopefully, protected. Certainly, of all "natural" lands in the state, the arguments for preservation of wet lands are exceedingly strong.

All of this is reason to pause and wonder about the effects such widespread preservation would have on the state. Obviously, we would have a lot of open space. My rough arithmetic indicates that if all potential preservation schemes are implemented, and if we add to this potential total, land which is already protected from development, then the total area to be preserved comes to about fifty percent of the land area of the state.

To remove this much land from development in a state which saw an eighteen percent increase in population between 1960 and

1970, and which is likely to see continued population growth for some time, could have interesting ramifications for the market value of land which is already built up, or which (in spite of limitations) may be developable in the future. Certainly, the already skyrocketing real estate prices in the state would be boosted further if population growth continues while large areas of land are removed from the market.

David Berry's paper outlines a philosophical base for thinking about decisions concerning development, and for establishing fair rates of compensation to parties injured by any decisions which are made. Michael Ontko's paper outlines the issues relating to development versus non-development of areas such as the Pine Barrens, presents techniques which are available for the preservation of various types of open space, and suggests steps which should be taken to implement these techniques.

All of this discussion is very useful and informative, but it does seem that there is one major element missing in the papers taken as a whole. It is clear to this writer that land will be needed for the population growth which New Jersey is going to experience. Equally clear is the need to provide for use limitation or outright preservation of important marine related, agricultural, and wilderness areas. These two needs

are, of course, contradictory to one degree or another. First, of all, if high proportions of the state are held for preservation, then the market value of land will be driven to extremely high levels, thereby excluding large numbers of the population from the housing market, or at best confining them to vertical human filing cabinets. This eventuality raises the question "preservation for whom," or the even more ominous question "preservation of whom." In the second place, continued population growth will, at some point, result in demands for "opening up land" for settlement. That is, as numbers of people increase and non-preserved land is fully settled, then it is likely that pressure to allow settlement of preserved land areas will become intense. In the long run, keeping as much as fifty percent of the state's land as open space is politically untenable. Therefore, it is imperative that priorites for development, and priorities for preservation be established in the near future. Neither of the papers being reviewed here deals with this issue fully.

Any priority assignment system will likely be of a normative nature. Once norms for development and preservation are drawn up, then someone can construct a decision model which will

allow the norms to be reflected in day to day land use decisions. This immediately begs the question "who sets the norms and constructs the decision model?" Several possibilities seem to stand out: 1) reliance on expert opinion, 2) measures based on the will of the people or public opinion, and 3) the "free market." In turn, each of these has its advantages and disadvantages.

Experts presumably know more than the public about what types of existing land are ecologically, economically, esthetically, or otherwise important for preservation. Similarly, experts ought to be able to provide guidelines concerning where development ought to take place. On the other hand, reliance upon expert opinion is by its very nature undemocratic, and would for this reason be unpopular.

A more democratic procedure would be to go to the citizens and ask what types of land should be preserved in what quantities, and to determine opinions concerning where development should take place and in what categories. Such an approach would presumably give each citizen an equal voice in decision making. This approach also has problems. First, the citizens, not being experts, may make decisions that result in severe

environmental or other harm. Second, the citizen may have little conception of the true range of alternatives and may therefore select a development and preservation configuration which is needlessly suboptimal. Third, the system would be administratively unwieldly. Finally, it would possibly violate the rights of minorities, unless such rights were explicitly preserved.

The so called "free market" system would overcome the problems associated with administration--the invisible hand does it all. However, to the extent that land is a public good, each citizen or group of citizens should have, as a minimum, equal opportunity to determine land use policy. The market system is set up such that each individual's vote is multiplied by the amount of money he has, and as long as income and wealth are distributed unequally, then there will not be equal opportunity to influence land use policy under this system. Also to the extent that the market does not take environmental, social, and other noneconomic factors into account it is an imperfect mechanism for making land use decisions. In narrowly defined economic terms (i.e. ignoring externalities) the highest and best use of the marsh lands is an oil refinery, or a high

density housing area. The market does not normally incorporate environmental impacts, while man can incorporate them, using other institutions, and would thus be neglegent to leave land use decisions solely to the market.

Obviously, neither experts, nor public opinion, nor the free market is, by itself, adequate for making rational decisions concerning development and preservation. Possibly, the best parts of the three systems can be combined. For example, the role of experts could be limited to outlining the alternatives, as well as the advantages and disadvantages of each alternative. The various choices could then be placed before the citizens in the form of a carefully administered public opinion survey. The results of such a survey could serve as a major input to the development of a land use plan by appropriate agencies. The plan formulated by the agency, in light of the opinion survey, could then be placed before the voters for approval. This method would allow the best features of the "expert" and "public opinion" approaches to be incorporated into the decision process. The "free market" might be allowed to operate in areas not saved from development, although there might be design or density restrictions.

Nothing said here actually tackles the tough nut of setting priorities for preservation or development. At best, a mechanism is outlined which shows how priorities might be set through the interaction of experts and the public. I should emphasize that there is no claim that the mechanism outlined here is in any way optimal or even practical. The intention has been to suggest possibilities in order to stimulate thought.

Footnotes

1. For example, two major limited access highways connect South Jersey with central and northern areas of the state that are presently highly built up. Recently, the Commodore Perry Bridge between Chester, Pa. and Bridgeport, N.J. was completed. This connection makes relatively underdeveloped areas of South Jersey much more accessible to the more heavily developed western margin of the Philadelphia metropolitan area. The Lindenwold-Philadelphia High Speed Line already connects the Philadelphia CBD with the fringes of the Pine Barrens, and a Gloucester County branch of the speed line which will terminate in Glassboro is planned. All of these transport links connect areas that are presently highly urbanized (i.e., Philadelphia, and already built up areas of New Jersey) with areas of New Jersey that are presently largely agricultural or wilderness.

2. Note in response: Using the χ^2 test, the probability of a statistically significant dependence between income class and length of residence is less than .01. That is, newer residents do not have higher or lower incomes than longer term residents.

3. Note in response: Many large tracts of undeveloped land are held by developers or speculators. No test was made to see if holdings by respondents (if any) varied with length of residence, however.

A Selective Pine Barrens Bibliography*

Berry, David and R.E. Coughlin, Economic Implications of Preserving Ecologically Valuable Land in Medford, New Jersey, Regional Science Research Institute, Philadelphia, Pa., 1973.

Center for Ecological Research in Planning and Design, "An Ecological Planning Study of Medford Twp., New Jersey" Dept. of Landscape Architecture, University of Pennsylvania, Philadelphia, Pa., 1973.

Feinstein, Miles R., "The Origins of the Pineys," Unpublished Masters Thesis, Rutgers University, New Brunswick, New Jersey, 1963.

Haines, Loraine B., "Cranberries in New Jersey," Unpublished Masters Thesis, Trenton State College, Trenton, New Jersey, 1959.

Harshberger, John W., The Vegetation of the New Jersey Pine-Barrens, Christopher Sower Co., Philadelphia, Pa. 1916.

Kury, Theodore, "Iron as a factor in New Jersey Settlement", Proceedings of the Second Annual Symposium of the New Jersey Historical Commission, Trenton, New Jersey, Dec.5, 1970.

Lutz, H.J., "Concerning a Geologic Explanation of the Origin and Present Distribution of the Pine Barrens Vegetation," Ecology, 15 (1934).

*For a more complete listing of regional and historical works on New Jersey which include references to the Pine Barrens see McGarvey, Robert, "The Pine Barrens: Isolation and Image" listed in this bibliography.

McCormick, Jack, The Pine Barrens: A Preliminary Ecological Analysis, New Jersey State Museum, Report Number 2, Trenton, New Jersey, 1970.

McGarvey, Robert, "The Pine Barrens: Isolation and Image" Unpublished Masters Thesis, Temple University, Philadelphia, Pa., 1972.

McPhee, John, The Pine Barrens, Farrar, Straus and Giroux, New York, 1968.

McPhee, John and William R. Curtsinger, "The People of New Jerseys Pine Barrens," National Geographic Magazine, Vol. 145, No. 1 (Jan, 1974), 52-77.

National Park Service, U.S. Dept. of the Interior, "The Pine Barrens of New Jersey - a Study in Alternatives," Feb. 1969,(unpublished report).

Pinelands Advisory Committee, "Report to the Freeholders of Burlington County," July 1970.

Rhodehamel, Edward C., "A Hydrological Analysis of the New Jersey Pine Barrens,"U.S.G.S., Department of the Interior, 1966.

Smith, Herbert H. and Associates, Future Development Plans-The New Jersey Pineland Region, Pinelands Regional Planning Board, Trenton, New Jersey, 1964.

Thomas, Lester S., "The Pine Barrens of New Jersey,"Pamphlet of Dept. of Environmental Protection, Bureau of Parks, Trenton, New Jersey, 1971.

Townley, Rod, "Deliverance in the Pine Barrens, "The Philadelphia Inquirer, Sunday Magazine Section, August 26, 1973.

RECENT REPORTS OF THE
REGIONAL SCIENCE RESEARCH INSTITUTE

PHILADELPHIA REGION INPUT-OUTPUT STUDY, by Walter Isard, Thomas W. Langford, Jr., and Eliahu Romanoff, WORKING PAPERS, Volumes 1 and 2: January 1967, Volume 3: January 1968, Volume 4: July 1968. FINAL COEFFICIENT TABLE, 1970. Complete set, $19.75.

PRELIMINARY PLAN AND PROGRAM FOR THE UPPER EAST BRANCH OF THE BRANDYWINE, by Robert E. Coughlin, J. R. Myers, and Benjamin H. Stevens (with John C. Keene and Ann Louise Strong of the Institute of Environmental Studies, University of Pennsylvania) June 1967. $2.00.

RELATIVE ECONOMIC EFFECTS ON PENJERDEL OF TWO ALTERNATIVE JETPORT PROPOSALS IN NEW JERSEY, by Robert E. Coughlin and Thomas W. Langford, Jr., June 1969. $3.00.

FUNCTIONAL AND ECONOMIC INTERDEPENDENCE IN THE BALTIMORE REGION, by Robert E. Coughlin and Heber Tappata, March 1970. $2.50.

REPORT ON THE BALTIMORE REGION INPUT-OUTPUT STUDY, by Thomas W. Langford, Jr., and Robert E. Coughlin, May 1971. $5.00.

IMPACT OF THE PROPOSED 1976 PHILADELPHIA BICENTENNIAL EXPOSITION ON PRODUCTION, INCOME, AND TAXES, by Benjamin H. Stevens and Robert E. Coughlin, March 1972. $2.00.

THE INFLUENCE OF WATER QUALITY IN THE EVALUATION OF STREAM SITES, by Ursula Scherer and Robert E. Coughlin, October 1971. $2.00.

DECISION MODEL FOR CAPITAL BUDGETING FOR THE STATE OF NEW JERSEY, by Benjamin H. Stevens and Robert E. Coughlin, November 1972. $5.00.

ENVIRONMENTAL STUDY OF THE WISSAHICKON WATERSHED WITHIN THE CITY OF PHILADELPHIA, PART I: ANALYSIS AND FINDINGS, by Robert E. Coughlin and Thomas R. Hammer, June 1973. $6.00.

ECONOMIC IMPLICATIONS OF PRESERVING ECOLOGICALLY VALUABLE LAND IN MEDFORD, NEW JERSEY, by David Berry and Robert E. Coughlin, September 1973. $6.00.

EFFECTS OF URBANIZATION ON STREAM CHANNELS AND STREAM FLOW, by Thomas R. Hammer, November 1973. $6.00.

THE PUBLIC LIBRARY OF NEWARK: A GENERAL SYSTEM PLANNING STUDY, by Robert E. Coughlin and Barbara Grinnell, September 1973. $6.00.

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT, by Robert E. Coughlin and Thomas R. Hammer, May 1973. $2.25.

RECENT DISCUSSION PAPERS
OF THE
REGIONAL SCIENCE RESEARCH INSTITUTE

No. 12 AN INVESTIGATION OF LOCATION FACTORS INFLUENCING THE ECONOMY OF THE PHILADELPHIA REGION, by Benjamin H. Stevens, Carolyn A. Brackett, and Robert E. Coughlin, March 1967. $3.00.

No. 29 IMPACT OF VIET NAM WAR EXPENDITURES ON THE PHILADELPHIA ECONOMY, by Walter Isard and Thomas W. Langford, Jr., May 1969. $3.00.

No. 41 GOAL ATTAINMENT LEVELS IN 101 METROPOLITAN AREAS, by Robert E. Coughlin, December 1970. $3.00.

No. 42 AIR QUALITY AND ITS RELATIONSHIP TO ECONOMIC, METEOROLOGICAL, AND OTHER STRUCTURAL CHARACTERISTICS OF URBAN AREAS IN THE UNITED STATES, by John Welson and Benjamin H. Stevens, December 1970. $2.50.

No. 43 SOME EXPERIMENTS IN QUANTITATIVE MEASUREMENT OF LANDSCAPE QUALITY, by Carla B. Rabinowitz and Robert E. Coughlin, March 1971. $2.00.

No. 44 DUALITY THEORIES IN LINEAR, QUADRATIC AND CONVEX PROGRAMMING: A SURVEY, by Nazir G. Dossani, May 1971. $2.00.

No. 45 LAND VALUES AND ENVIRONMENTAL CHARACTERISTICS IN THE RURAL-URBAN FRINGE, by Robert E. Coughlin and James Fritz, May 1971. $2.00.

No. 46 RESIDENTIAL ENVIRONMENTAL PREFERENCES AND CHOICE: SOME PRELIMINARY EMPIRICAL RESULTS RELEVANT TO URBAN FORM, by Mark D. Menchik, March 1971. $3.00.

No. 47 COST-BENEFIT AND COST-EFFECTIVENESS ANALYSES: THEIR APPLICATION IN EVALUATING INVESTMENT DECISIONS IN URBAN PUBLIC SERVICES AND FACILITIES, by David A. Good, June 1971. $2.00.

No. 48 REGIONAL HEALTH FACILITY SYSTEM PLANNING: AN ACCESS OPPORTUNITY APPROACH, by Jerry B. Schneider and John G. Symons, Jr., July 1971. $2.50.

No. 50 THE INTENSITY OF DEVELOPMENT ALONG SMALL AND MEDIUM SIZED STREAMS IN SUBURBAN PHILADELPHIA, by Robert E. Coughlin, Sallie Sheldon and Thomas R. Hammer, September 1971. $2.00.

No. 51 THE EFFECT OF A LARGE URBAN PARK ON REAL ESTATE VALUE, by Thomas R. Hammer, Edward T. Horn, IV, and Robert E. Coughlin, September 1971. $2.00.

RECENT DISCUSSION PAPERS - Contined

No. 52 THE CELL-COUNT THEORY OF STOCHASTIC POINT PROCESSES, by Tony E. Smith, February 1972. $3.00.

No. 53 PERCEPTION AND USE OF STREAMS IN SUBURBAN AREAS: EFFECTS OF WATER QUALITY AND OF DISTANCE FROM RESIDENCE TO STREAM, by Robert E. Coughlin, Thomas R. Hammer, Thomas G. Dickert, and Sallie Sheldon, March 1972. $2.00.

No. 54 ON THE RELATIVE-FREQUENCY INTERPRETATION OF FINITE MAXIMUM-ENTROPY DISTRIBUTIONS, by Tony E. Smith, April 1972. $2.00.

No. 55 STREAM CHANNEL ENLARGELENT DUE TO URBANIZATION, by Thomas R. Hammer, May 1972. $2.00.

No. 56 ON THE TRANSFORMATIONAL INVARIANCE OF MAXIMUM-LIKELIHOOD ESTIMATORS, by Tony E. Smith, July 1972. $1.00.

No. 57 EMPIRICAL ESTIMATION OF FLOOD DETENTION CAPACITY NEEDED TO OFFSET EFFECTS OF URBANIZATION ON PEAK STREAMFLOW, by Thomas R. Hammer, July 1972. $2.50.

No. 59 A PILOT HOUSEHOLD SURVEY OF PERCEPTION AND USE OF A LARGE PARK, by Ursula Scherer and Robert E. Coughlin, December 1972. $2.00.

No. 60 ON THE EXISTENCE OF MOST PREFERRED ALTERNATIVES, by Tony E. Smith, December 1972. $2.00.

No. 61 ENVIRONMENTAL PROTECTION AND COLLECTIVE ACTION: THE CASE OF URBAN OPEN SPACE, by David Berry, January 1973. $2.00.

No. 62 RATIONALITY OF INDECISIVE CHOICE FUNCTIONS, by Tony E. Smith, February 1973. $1.00.

No. 63 IMPACT OF URBANIZATION ON PEAK STREAMFLOW, by Thomas R. Hammer, June 1973. $2.50.

No. 64 PROPERTY VALUES AND OPEN SPACE IN NORTHWEST PHILADELPHIA: AN EMPIRICAL ANALYSIS, by Robert E. Coughlin and Tatsuhiko Kawashima, July 1973. $2.00.

No. 65 PERCEPTIONS OF LANDFILL OPERATIONS HELD BY NEARBY RESIDENTS, by Robert E. Coughlin, Harriet Newburger, and Cary Seigner, August 1973. $2.00.

No. 66 WATER QUALITY IMPACTS OF UNSEWERED HOUSING, by William T. Howard and Thomas R. Hammer, September 1973. $2.00.

RECENT DISCUSSION PAPERS - Continued

No. 67 ON THE SPECIFICATION OF AUTOCORRELATED ERRORS, by Tony E. Smith, September 1973. $1.00.

No. 68 EFFORTS AT INTERMUNICIPAL COOPERATION FOR SOLID WASTE DISPOSAL: WHY THEY FAIL, by Jane Gilbert, October 1973. $2.00.

No. 69 THE CONCEPT OF JUSTICE IN REGIONAL PLANNING: SOME POLICY IMPLICATIONS, by David Berry, November 1973. $1.50.

No. 70 SOLID WASTE GENERATION COEFFICIENTS: MANUFACTURING SECTORS, by Gene Steiker, December 1973. $3.50.

No. 71 SINGLE-PERIOD STATIONARITY IN OPEN SYSTEMS OF REGIONS, by Tony E. Smith, March 1974. $2.00.

No. 72 A FRAMEWORK FOR EVALUATING THE ECONOMIC EFFECTS OF REGIONAL SOLID WASTE SYSTEMS, by Gene Steiker, April 1974. $2.00.

No. 73 THE PRESERVATION OF OPEN SPACE IN THE NEW JERSEY PINELANDS, by, D. Berry, M. Ontko, D. Scott, M. Silberfein and G. Steiker, May 1974. $3.50.

Subscriptions to the 1974 Series are available at the price of $18.00 in U.S. funds, payable in advance. Checks should be made out to the Regional Science Research Institute and mailed promptly to the Regional Science Research Institute, GPO Box 8776, Philadelphia, Pennsylvania 19101.